

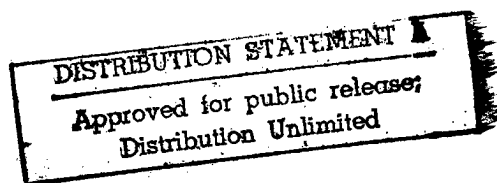


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JPRS Report

Science & Technology

***Central Eurasia:
Chemistry***



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CONTENTS

30 December 1992

CATALYSIS

Kinetics of the Transformation of Isopropanol Into Acetone on a Silver-Containing Catalyst [R.Kh. Karimov, M.M. Azizov; <i>UZBEKSKIY KHIMICHESKIY ZHURNAL</i> , No 1, Jan-Feb 92]	1
Catalytic Synthesis of Pyridine Bases Based on Methylethylethylene Carbinol [M.F. Fayzullayeva, T.S. Sirlibayev, et al.; <i>UZBEKSKIY KHIMICHESKIY ZHURNAL</i> , No 1, Jan-Feb 92]	1
Development of Methods of Regenerating Deactivated Catalysts To Scrub Hydrogen Sulfide From Coke Gas [V.G. Lipovich, M.A. Kapustin; <i>KHIMIYA TVERDOGO TOPLIVA</i> , No 1, Jan-Feb 92]	1
Study of Properties of Chemically Modified Sorbents by Catalytic Method [G. A. Zolotova, L. N. Zhukova [deceased], et al.; <i>ZHURNAL ANALITICHESKOY KHIMII</i> , Vol 47 No 5, May 92]	2
Electro-Migrational-Spectrophotometric Determination of Rhenium in Spent Catalysts [L. N. Bochkova [deceased], L. V. Borisova, et al.; <i>ZHURNAL ANALITICHESKOY KHIMII</i> , Vol 47 No 5, May 92]	2
Extraction Capability of Dibutyl Sulfide, Dibutyl Selenide, and Dibutyl Telluride in Respect to Gold (III) and Silver (I) [G. Burmaa, V. A. Potapov, et al.; <i>ZHURNAL ANALITICHESKOY KHIMII</i> , Vol 47 No 5, May 92]	2
Preparation of Rhodium Hydrogenation Catalysts Using Photo Radiation [K. K. Kuzembayev, S. M. Turganbayeva, et al.; <i>IZVESTIYA AKADEMII NAUK RESPUBLIKI KAZAKHSTAN: SERIYA KHIMICHESKAYA</i> , No 1(271), Jan-Feb 92]	2
Catalytic Purging of Oxides of Nitrogen and Sulfur Dioxide Gases from Other Gases. Part 1. Purging Gases of Oxides of Nitrogen [K. A. Zhubanov, N. R. Bukeykhanov, et al.; <i>IZVESTIYA AKADEMII NAUK RESPUBLIKI KAZAKHSTAN: SERIYA KHIMICHESKAYA</i> , No 1(271), Jan-Feb 92]	3
Hydrogenation of CO on Technetium Catalysts [N.M. Panich, T.A. Lagutina, et al.; <i>IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA</i> , No 7, Jul 92]	3
Metal Complexes in Catalytic Transformations of Olefins. Communication 6. The Formation Mechanism and Nature of Precursors of Active Centers of the Dimerization of Ethylene in Butene-1 in the System $Ti(O-n-Bu)_4-AlEt_3$ in an Ether Medium [D.B. Furman, L.N. Russiyan, et al.; <i>IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA</i> , No 7, Jul 92]	3
Metal Complexes in Catalytic Transformations of Olefins. Communication 7. The Nature of Active Centers and the Mechanism of Processes of the Dimerization of Ethylene Into Butene-1 and the Polymerization of Acetylene in the System $Ti(O-n-Bu)_4-AlEt_3$ in a Medium of Esters [D.B. Furman, L.N. Russiyan, et al.; <i>IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA</i> , No 7, Jul 92]	4
Louis Acid Catalysis Under High Pressure as a Method of Involving Hindered Steroidal Dienophiles in the Diels-Alder Reaction [I.S. Levina, L. Ye. Kulikova, et al.; <i>IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA</i> , No 7, Jul 92]	4
New Highly Effective Olefin Polymerization Catalysts [V.A. Zakharov; <i>KHIMICHESKAYA PROMYSHLENNOST</i> , No 5, May 92]	5
Development and Model Tests of Method for Catalytic Purification of Acrylonitrile Impurities From Gases [V.M. Vlasenko, S.A. Solovyev, et al.; <i>KHIMICHESKAYA PROMYSHLENNOST</i> , No 5, May 92]	5
The Effective Heat Conduction of a Hydrocarbon Conversion Catalyst [D.L. Astanovskiy, V.P. Kiyashova, et al.; <i>KHIMICHESKAYA PROMYSHLENNOST</i> , No 5, May 92]	5
Effect of Water Vapor on Catalytic Oxidation of Hydrogen Sulfide With Oxygen [T. G. Alkhazov, L. L. Aronova, et al.; <i>ZHURNAL PRIKLADNOY KHIMII</i> Vol 64 No 11, Nov 91]	6

Investigation of Palladium Ion Exchange Kinetics on Ion Exchange Resins in Solution After Hydrochlorination of Spent Palladium Containing Catalysts [O. N. Kononova, A. G. Kholmogorov, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	6
Pilot Investigation of Dehydrogenation Process of C ₄ Hydrocarbons Into Butadiene in an Ascending Stream of Finely Dispersed Oxide Catalyst [V. I. Voznyuk, L. P. Shapovalova, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91] ..	6
Cobalt-Chromium Spinel Catalyst for Exhaustive Oxidation of Ethyl Chloride [V. M. Vlasenko, L. F. Feshchenko, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91] .	6
Cracking and Aromatization of C ₆ -C ₁₀ n-Alkanes and n-Alkenes Over Zeolite Containing Catalyst [T. M. Gayrbekov, M. I. Takayeva, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91] .	7
Effect of Thermal Treatment Conditions on Characteristics of Sulfate Catalysts [V. A. Markov, Iozef Tikhii, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	7
Chemical Reactions Among Components of Catalytic Coatings Over Metallic Carriers [R. Kh. Mukhutdinov, N. A. Samoylov; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	7

CHEMICAL INDUSTRY

A Strategy for Developing Russia's Chemical Industry [A.I. Salin; KHIMICHESKAYA PROMYSHLENNOST, No 5, May 92]	8
--	---

COMBUSTION AND EXPLOSIVES

Ways of Improving Thermal Processing of High-Ash Oil Shales [I.I. Lishtvan, K.B. Martinovich, et al.; KHIMIYA TVERDOGO TOPLIVA, No 1, Jan-Feb 92]	9
An Ecological-Economic Evaluation of the Creation of a No-Waste Process for Producing Pentaerythritol [V.A. Daut; KHIMICHESKAYA PROMYSHLENNOST, No 5, May 92]	9

ELECTROCHEMISTRY

An Electrochemical Method of Marking Products [R.F. Kudryashova; KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE, No 8, Aug 92] ...	10
Electrochemical Reduction of Oxygen on Soot in Alkaline Medium [N. V. Chayenko, G. V. Korniyenko, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	10

ENVIRONMENTAL CHEMISTRY

Synthesis, Study, and Application of Chelate-Forming Sorbents for Concentrating and Determining Micro Quantities of Elements in Natural and Waste Waters [N. N. Basargin, Yu. G. Rozovskiy, et al.; ZHURNAL ANALITICHESKOY KHIMII, Vol 47 No 5, May 92]	11
Determining Starting Requirements for Standardization and Standards Regulating Emissions From City Enterprises With Consideration for Data From Observations of Atmospheric Pollution [A.S. Belyavskiy; KHIMICHESKAYA PROMYSHLENNOST, No 6, Jun 92]	11
The Fire Hazard of Spherical Tanks for Storing Rarefied Hydrocarbon Gases Under Pressure [A.P. Shevchuk, Yu.N. Shebeko, et al.; KHIMICHESKAYA PROMYSHLENNOST, No 6, Jun 92]	11
Synthesis of Aluminum Hydroxy Sulfate by Electrochemical Method for Purification of Effluent [L. Ye. Sitchikhina, I. V. Gofenberg, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	12

FERTILIZERS

Current Problems in the Production of Phosphorus-Containing Fertilizers (The Creation of New-Generation Manufacturing Systems) [I.M. Kuvshinnikov, V.G. Kazak, et al.; KHIMICHESKAYA PROMYSHLENNOST, No 6, Jun 92]	13
---	----

INORGANIC COMPOUNDS

- The Formation of Dimers in a Reaction of Aryl Halides Catalyzed by Nickel Complexes
[Yu.G. Budnikova, Yu.M. Kargin, et al.; *IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA*, No 7, Jul 92] 14

MATERIALS RESEARCH

- A Study of the Chemical Composition and Structure of Fusinite Brown Coals by Products of Their Ozonolysis
[Z.M. Perednikova, Z.A. Rumyantseva, et al.; *KHIMIYA TVERDOGO TOPLIVA*, No 1, Jan-Feb 92] ... 15
- The Interconnection Between Strength and Porosity and the Conditions of the Impregnation of Filler-Braids of Carbon Materials
[S.A. Kolesnikov, V.I. Kostikov, et al.; *KHIMIYA TVERDOGO TOPLIVA*, No 1, Jan-Feb 92] 15
- Decreased Stability of Optical Quartz Fibers on Removing Polymeric Coating
[L. G. Baykova, T. I. Pesina, et al.; *FIZIKA I KHIMIYA STEKLA Vol 18 No 2, Mar-Apr 92*] 15
- Action of γ -Radiation on Light Attenuation in Multicomponent Glass Light Guides
[P. K. Khabibullayev, G. A. Tavshunskiy, et al.; *FIZIKA I KHIMIYA STEKLA Vol 18 No 2, Mar-Apr 92*] 16
- Voltamperimetric Determination of Trace Amounts of Chromium in Gallium Arsenide
[M. Vanichkoova, Ya. Labuda, et al.; *ZHURNAL ANALITICHESKOY KHIMII*, Vol 47 No 5, May 92] 16
- Resonance Interaction of Reflected Waves with Acute Asymmetric Diffraction on Superlattices
[A. P. Ayvazyan; *KRISTALLOGRAFIYA*, Vol 37 No 1, Jan-Feb 92] 16
- Estimation of Distortion Elasticity and Residual Stresses of Yttrium-Aluminum Garnet
[E. L. Lube, A. T. Zlatkin, et al.; *KRISTALLOGRAFIYA*, Vol 37 No 1, Jan-Feb 92] 16
- Computerized Simulation of Relative Arrangement of Molecules in Cholesterol Liquid Crystal Phase
[I. L. Dubchak, T. V. Timofeyeva, et al.; *KRISTALLOGRAFIYA*, Vol 37 No 1, Jan-Feb 92] 17
- Magnetoreflexion of Birefringent Crystals
[N. A. Ivzhenko, E. P. Kolesnikova, et al.; *KRISTALLOGRAFIYA*, Vol 37 No 1, Jan-Feb 92] 17
- Development of Data Bases on Basic Manufacturing Equipment To Produce Chemical Reagents and Ultrapure Materials
[R.M. Malyshev, V.V. Avseyev, et al.; *KHIMICHESKAYA PROMYSHLENNOST*, No 6, Jun 92] 17
- Properties of Ni-Cr-Mo Alloys for the Chemical Industry
[M.V. Rolek, F.Ye. Uayt; *KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE*, No 8, Aug 92] 18
- The New Corrosion-Resistant Steel 02Cr24Ni22NMo2 for Media With an Elevated Level of Corrosiveness
[E.G. Feldgandler, L.Ya. Savkina, et al.; *KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE*, No 8, Aug 92] 18
- The Geometric Structure of Two-Phase Composite Materials
[I.V. Golubtsov, M.B. Kachalov, et al.; *VESTNIK MOSKOVSKOGO UNIVERSITETA - KHIMIYA*, Vol 33 No 3, May-Jun 92] 18
- Anodic Oxidation of Phenol on Platinum
[S.Yu. Shtyrkova, A.D. Semenova, et al.; *VESTNIK MOSKOVSKOGO UNIVERSITETA - KHIMIYA*, Vol 33 No 3, May-Jun 92] 19
- Design Theory and Practice and Trends in the Design of Contact Devices and Column Devices To Extract Pure Components From Mixtures of Liquids and Gases
[L.P. Razmolodin; *IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA*, Vol 35 No 4, Apr 92] 19
- The Transfer of Water Vapors in Composite Materials Based on SKEPT-50
[A.P. Belokurova, A.Ye. Chalykh, et al.; *IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA*, Vol 35 No 2, Feb 92] 19

POLYMERS AND RUBBER

- Kinetics of the Radical Polymerization of N-Acryloylbenzoxazolone
[M.M. Sultonov, B.L. Gafurov, et al.; *UZBEKSKIY KHIMICHESKIY ZHURNAL*, No 1, Jan-Feb 92] .. 20
- 2 Polyampholyte 2-Methyl-5-Vinylpyridine Methacrylic Acid Copolymer
[D. Ye. Nurgaliyeva, S. Ye. Kudaybergenov, et al.; *IZVESTIYA AKADEMII NAUK RESPUBLIKI KAZAKHSTAN: SERIYA KHIMICHESKAYA*, No 1(271), Jan-Feb 92] 20

The Unusual Photophysical Properties of a Polymer Film Made of Phenol [S.V. Rykov, Ye.D. Skakovskiy, et al.; IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA, No 7, Jul 92]	20
A New Approach To Developing Optimal Formulas of Polymer Composite Materials [Ye.V. Babenko, R.M. Galimzyanov, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA, Vol 35 No 4, Apr 92] I KHIMICHESKAYA TEKHOLOGIYA, Vol 35 No 4, Apr 92]	21
A Mass Spectrometry Study of the Gas Permeability of Polymer Film Materials [A.M. Pogrebnoy, L.S. Kudin, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA, Vol 35 No 2, Feb 92]	21
Water Sorption by Grafted Copolymers of Polycapromide and Polyglycidyl Metacrylate [L. P. Razumovskiy, N. Yu. Mosina, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	21
Properties of Hydrogels of 2-Hydroxyethylmetacrylate Copolymers Modified With Silicon Rubber [N. A. Lavrov, T. S. Kryzhanovskaya, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	21
Copolymerization of 2-Hydroxyethylmetacrylate With Metacrylic Acid in Water [N. A. Lavrov, A. F. Nikolayev, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	22
Investigation of Some Properties of Fiber Forming Acrylonitrile Copolymers With N-Vinylpyrrolidone [G. Khamrakulov, I. I. Ismailov, et al.; ZHURNAL PRIKLADNOY KHIMII Vol 64 No 11, Nov 91]	22

MISCELLANEOUS

Flame Atomic-Absorption Determination of Gold in Polymetallic Ores of Peoples Republic of Mongolia [G. Burmaa, G. Amar, S. V. Amosova, et al.; ZHURNAL ANALITICHESKOY KHIMII, Vol 47, No 5, May 92]	23
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Kinetics of the Transformation of Isopropanol Into Acetone on a Silver-Containing Catalyst

927M0206A Tashkent *UZBEKSKIY KHIMICHESKIY ZHURNAL* in Russian No 1, Jan-Feb 92 (manuscript received 24 Jul 91) pp 8-11

[Article by R.Kh. Karimov and M.M. Azizov; UDC 661.727:547.284]

[Abstract] The kinetics of the transformation of isopropanol into acetone was studied in a flowthrough circulation unit in order to establish the concrete mechanism of the transformation of low-molecular alcohols into aldehydes and ketones on silver catalysts. D-53 "silver-on-aluminosilicate" catalyst was used. The experiments established that the process may be conducted in the kinetic range at relatively low temperatures (below 400° C). The rate of acetone formation begins to increase at 250-350° C and decreases markedly when the temperature is raised to 400° C due to the effect of diffusion factors. At temperatures of 250 to 350° the transformation of isopropanol into acetone occurs in accordance with an oxidation mechanism; at higher temperatures, the transformation process moves from the kinetic range to the diffusion range and is dictated largely by heat and mass transfer. Replacing air with an air:helium mixture in 1:3, 1:2, and 1:1 ratios had practically no effect on the oxidation rate; however, process selectivity was lower in the case of air alone than with an air:helium mixture. It was hypothesized that water vapor displaces the acetone from the catalyst surface, thus impeding its oxidation. Figures 2; references 6 (Russian).

Catalytic Synthesis of Pyridine Bases Based on Methylethylethylene Carbinol

927M0206C Tashkent *UZBEKSKIY KHIMICHESKIY ZHURNAL* in Russian No 1, Jan-Feb 92 (manuscript received 8 May 91) pp 41-44

[Article by M.F. Fayzullayeva, T.S. Sirlibayev, and A. Ikramov, Tashkent Red Banner Order State University imeni V.I. Lenin; UDC 547(821+362+281)546.171.1]

[Abstract] The reaction of methylethylethylene carbinol and acetic aldehyde with ammonia in the presence of a zinc-chromium-aluminum catalyst was studied in an effort to develop a method of catalytically synthesizing pyridine bases based on methylethylethylene carbinol. The reaction was studied at temperatures of 300 to 440° C. The methylethylethylene carbinol was synthesized by means of Favorskii's reaction, and the reagents were obtained from the Navoi-Azot Production Association. A completely airtight flowthrough system was used for the experiments. Methylethylethylene carbinol:acetic aldehyde:ammonia at a ratio of 1.0:1.1:3.0 and the reagents were fed in with a space velocity of 86.0 to 86.3 h⁻¹. The reaction products were analyzed first by thin-layer chromatography and then by gas-liquid chromatography. The best results were obtained at 440° C, at which point the following were identified (wt.-%): 2-methylpyridine, 17.6; 4-methylpyridine, 15.9; 2,3,5-trimethylpyridine,

17.3; 2-methyl-6-ethylpyridine, 23.1; 2,3,6-trimethylpyridine, 15.1; and acetonitrile, 11.0. The following sequence of the formation of alkylpyridines from methylethylethylene carbinol was proposed: At high temperatures over a zinc-chromium-aluminum catalyst, acetylene alcohol splits into starting methyl ethyl ketone and acetylene. In the presence of hydrating catalysts, the latter complexes with water and forms acetic aldehyde, which in turn condenses in accordance with crotonic condensation, transforms into crotonic aldehyde, and reacts with methyl ethyl ketone and ammonia to form 2-methyl-6-ethylpyridine as the main reaction product. The formation of 2,3,4-trimethylpyridine from methyl ketones, crotonic aldehyde, and ammonia was shown to proceed in accordance with Michael's reaction with the formation of 1,5-diketones that result in dihydropyridines, which in turn are dehydrated into pyridines and give up hydrogen molecules to the excess crotonic aldehyde. Acetonitrile was shown to serve as an intermediate compound in the formation of alkylpyridines. Table 1; references 10: 9 Russian, 1 Western.

Development of Methods of Regenerating Deactivated Catalysts To Scrub Hydrogen Sulfide From Coke Gas

927M0207C Moscow *KHIMIYA TVERDOGO TOPLIVA* in Russian No 1, Jan-Feb 92 (manuscript received 18 Mar 91) pp 109-111

[Article by V.G. Lipovich and M.A. Kapustin, High-Temperatures Institute, USSR Academy of Sciences; UDC 66.092.662.75]

[Abstract] Different methods of regenerating catalysts deactivated when scrubbing hydrogen sulfide from coke gas were compared. The catalysts studied contained 2.7% Ni and 29% SiO₂ and had previously been used in coke gas oxidation at the Moscow Coke Gas Plant. The sample catalysts were subjected to heat treatment in an argon atmosphere, after which steam was fed in at temperatures of 200, 300, and 350° C for 1 to 2 hours. Another catalyst sample was activated in an argon current, after which a mixture of hydrocarbon gases was fed in at 550° C for 2 hours. The data obtained during the tests of the regenerated samples were compared with results obtained with a freshly prepared analogue. Among the regenerated catalysts, the best results were obtained in the case of the catalyst that had been treated at 350° C in a steam and argon atmosphere and in the case of the catalyst treated at 550° C in a hydrocarbon and argon atmosphere. The freshly prepared catalyst had an activity of 17.4 g-mol H₂S/g-at Ni, whereas the sample regenerated at 350° C in an atmosphere of argon and steam had an activity of 28.2 g-mol H₂S/g-at Ni. In-depth tests of the catalysts were conducted at the Kharkov Experimental By-Product Coke Plant. Once again, the freshly prepared catalyst proved less active than the regenerated catalyst. At the Kharkov plant, the regenerated catalyst manifested an activity of 9.58 g-mol H₂S/g-at Ni as opposed to the activity level of 17.4 g-mol H₂S/g-at Ni determined in Moscow. After repeated

regeneration at 350° C for 2 hours in steam and propane, the catalyst tested in Kharkov exhibited an increase in activity level to 19.26 g-mol H₂S/g-at Ni. Tables 2; references 3 (Russian).

Study of Properties of Chemically Modified Sorbents by Catalytic Method

927M0223A Moscow *ZHURNAL ANALITICHESKOY KHIMII* in Russian Vol 47 No 5, May 92 (manuscript received 27 Aug 91) pp 783-785

[Article by G. A. Zolotova, L. N. Zhukova [deceased], I. Ye. Talut, M. I. Kravtsova, and A. K. Trofimchuk, Moscow State University imeni M. V. Lomonovskiy; Kiev State University imeni T. G. Shevchenko; UDC 543.422:543.54]

[Abstract] Chemically modified silicas, i.e. silica having organic groups bound covalently to the silica surface, are used widely as sorbents in the separation and concentration of microelements, and as the stationary phase in high efficiency liquid chromatography. One feature of these silicas is a comparatively low concentration of grafted compounds, in the order of 0.1-0.5 mmole per 100 m² of surface area, and as a result analytical determination of grafted compounds is difficult since conventional analytical methods are not sensitive enough and are laborious. However, knowing the concentration of grafted groups is required to interpret sorption equilibrium processes and practical utilization of the sorbent. An important feature of these silicas is their resistance to hydrolysis and heat during selective sorption of heavy metals from hot waters, and sorption leaching of kinetically inert platinum metal complexes. In the present work a study was made of the hydrolytic and thermal resistance of silicas grafted with N-propyl-N'-phenylthiourea and N-propyl-N'-benzoylthiourea in selective leaching of heavy and platinum metals. A procedure is presented for determining sorption capacity of sorbents modified with sulfur-containing groups employing a catalytic method for determining sulfur-organic compounds on the basis of the oxidation of o-aminophenol with hydrogen peroxide in phosphate buffer. References 5: 4 Russian, 1 Western.

Electro-Migrational-Spectrophotometric Determination of Rhenium in Spent Catalysts

927M0223C Moscow *ZHURNAL ANALITICHESKOY KHIMII* in Russian Vol 47 No 5, May 92 (manuscript received 27 June 90) pp 809-813

[Article by L. N. Bochkova [deceased], L. V. Borisova, and Ye. K. Korchemnaya, Geochemistry and Analytical Chemistry Institute imeni V. I. Vernadskiy, Moscow; UDC 546.719:543.253]

[Abstract] Spent rhenium- and platinum-on-alumina catalysts may be recycled by various methods. After separation by sorption, acidic solutions containing the rhenium and platinum, as well as Al, Fe, and Ti, are passed

through a column containing a chelate-forming sorbent having ethylenediamine functional groups. The platinum and rhenium are sorbed, eluted, and determined spectrophotometrically. This method is laborious, time consuming, requires large amounts of eluate, and loss of the elements is possible. In the present work a simple and rapid method without elution is proposed. The method is based on electrophoretic separation of rhenium and platinum on an acetyl cellulose membrane with subsequent spectrophotometric determination after dissolving corresponding portions of the membrane in concentrated HCl. References 16: 9 Russian, 7 Western.

Extraction Capability of Dibutyl Sulfide, Dibutyl Selenide, and Dibutyl Telluride in Respect to Gold (III) and Silver (I)

927M0223E Moscow *ZHURNAL ANALITICHESKOY KHIMII* in Russian Vol 47 No 5, May 92 (manuscript received 23 Sep 91) pp 930-932

[Article by G. Burmaa, V. A. Potapov, S. V. Amosova, and A. A. Khlebnikova, Organic Chemistry Institute, Irkutsk; Chemistry Institute, Ulan-Bator; UDC 542.61:546.571:546.593:547.279]

[Abstract] Dialkyl sulfides are used widely as extractants in the determination of gold in various objects. Data on the extracting capabilities of dialkyl selenides and tellurides in respect to gold and silver are lacking the literature. In the present work a comparison was made of the extracting capabilities of the title compounds in respect to gold (III) and silver (I). It was demonstrated that dibutyl sulfide and selenide are close in respect to gold extraction, while dibutyl selenide and telluride are better for silver extraction from weak acids than dibutyl sulfide. Figures 2; references 7: 6 Russian, 1 Western.

Preparation of Rhodium Hydrogenation Catalysts Using Photo Radiation

927M0224A Alma-Ata *IZVESTIYA AKADEMII NAUK RESPUBLIKI KAZAKHSTAN: SERIYA KHIMICHESKAYA* in Russian No 1(271), Jan-Feb 92 (manuscript received 29 May 91) pp 14-17

[Article by K. K. Kuzembayev, S. M. Turganbayeva, and B. K. Beksultanova, Organic Catalysis and Electrochemistry Institute, Alma-Ata; UDC 66.097.3]

[Abstract] Dwindling reserves of mined fuels has generated the need to develop new non-traditional energy sources, such as the possibility of using solar energy to prepare catalysts. This would lower the costs of existing chemical processes and also create new, more efficient, and ecologically clean production methods. Photoprecipitation of metals from solutions of their salts in the presence of semiconductor dispersions, and the effects of such factors as duration and intensity of radiation, precipitation medium, and others on the dispersion of the precipitated particles have been studied previously. Although the practical applications of this method have

been demonstrated, the interaction of the above factors on the activities of hydrogenation catalysts have not yet been published. In the present work 0.5 percent rhodium catalysts on TiO_2 , SnO_2 , and WO_3 carriers were prepared using visible and ultraviolet radiation from a DRSh-500 light. The activities of these catalysts in cyclohexane hydrogenation compared favorably with similar catalysts prepared by impregnation and reduction in a pipe furnace for 3 hours at 300° C. Figures 2; references 5: 1 Russian, 4 Western.

Catalytic Purging of Oxides of Nitrogen and Sulfur Dioxide Gases from Other Gases. Part 1. Purging Gases of Oxides of Nitrogen

927M0224B Alma—Ata IZVESTIYA AKADEMII NAUK RESPUBLIKI KAZAKHSTAN: SERIYA KHIMICHESKAYA in Russian No 1(271), Jan-Feb 92 (manuscript received 4 Feb 91) pp 33-42

[Article by K. A. Zhubanov, N. R. Bukeykhanov, V. S. Yemelyanov, K. R. Shayakhmetova, S. A. Tungatarov, and T. S. Khairliyeva, Petroleum Chemistry and Natural Salts Institute, Guryev; Kazakh State University imeni Al-Farabi; UDC 546.172.6:541.124]

[Abstract] While a great many methods exist for purging off gases of oxides of nitrogen and sulfur dioxide, much attention has been devoted in recent years to catalysis. The present work is a review of catalytic methods for stripping off gases of oxides of nitrogen. In all cases advantage is taken of the ability of nitrogen oxide to act as both an oxidizing and a reducing agent. In the gaseous phase catalytic reduction takes place at 200-1000° C, depending on the nature of the electron donor in the catalyst. Nitrogen oxides reduction in the liquid phase takes place under more mild conditions, at 0-150° C. References 79: 17 Russian, 62 Western.

Hydrogenation of CO on Technetium Catalysts

927M0241A Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No 7, Jul 92 (manuscript received 24 May 91) pp 1507-1511

[Article by N.M. Panich, T.A. Lagutina, and G.N. Pirogova, Physical Chemistry Institute, Russian Academy of Sciences, Moscow; UDC 542.941.7:546.262.3-31:546.718]

[Abstract] The catalytic properties of technetium catalysts of the hydrogenation of carbon monoxide were studied. The catalysts were produced by impregnating carriers with an aqueous solution of NH_4TcO_4 and then drying them for 2 hours at 100°. They were reduced with hydrogen for 2 hours at 270° and for 12 hours at 500°. $\gamma\text{-Al}_2\text{O}_3$, SiO_2 (KSK-2), MgO , Y_2O_3 , and ZrO_2 were used as carriers. The catalytic hydrogenation was performed in a KL-1 unit. The pulse method was used to feed the starting materials into the unit (0.64 ml/pulse). The starting gas mixture had a CO:H_2 ratio of 1:2 (vol). The

reaction products were analyzed on a Tsvet-100 chromatograph, the starting gas was analyzed on a katharometer, and the gaseous products were analyzed on a column filled with polysorb-1. The temperature of the onset of the reaction was about 210°. As the temperature increased, the conversion of CO(X) into CH_4 increased. The greatest degree of transformation was achieved on $\text{Tc}/\gamma\text{-Al}_2\text{O}_3$. In the temperature interval studied, Tc/MgO manifested the lowest catalytic activity: At 380°, less than 5% of the CO had been converted. The catalysts studied may be ranked as follows in order of moderating activity as calculated for 1 g of technetium: $\text{Tc}/\gamma\text{-Al}_2\text{O}_3 > \text{Tc}/\text{SiO}_2 \approx \text{TcZrO}_2 > \text{Tc}/\text{MgO}$ (200-300°). In all cases, the reaction proceeded primarily in the direction of methanation. All of the catalysts studied manifested a low selectivity with respect to the formation of $\text{C}_2\text{-C}_3$. The data obtained from thermal desorption studies conducted in an argon stream with a linear program of increasing the temperature from 20 to 1,000 at a rate of 20 K/min confirmed the hypothesis that strongly bound forms of carbon monoxide participate in the reaction of CH_4 formation. Figures 2, tables 3; references 7: 5 Russian, 2 Western.

Metal Complexes in Catalytic Transformations of Olefins. Communication 6. The Formation Mechanism and Nature of Precursors of Active Centers of the Dimerization of Ethylene in Butene-1 in the System $\text{Ti}(\text{O-n-Bu})_4\text{-AlEt}_3$ in an Ether Medium

927M0241B Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No 7, Jul 92 (manuscript received 6 Jun 91) pp 1516-1525

[Article by D.B. Furman, L.N. Russiyan, V.N. Noskova, O.V. Bragin (deceased), and P.Ye. Mamkovskiy, Organic Chemistry Institute imeni N.D. Zelinskiy, Russian Academy of Sciences; UDC 547.313.2:66.095.264.3:541.127]

[Abstract] A series of experiments were conducted to gain information about the formation and nature of the precursors of active centers of the dimerization of ethylene into butene-1 during the reaction of $\text{Ti}(\text{O-n-C}_4\text{H}_9)_4$ with organoaluminum compounds in a medium of esters. The organoaluminum compounds studied shared the general formula AlR_3 ($\text{R} = \text{Me}$, Et , $i\text{-Bu}$), and R_2O , Py , and Et_3N were used as solvents. The reactions were conducted at temperatures ranging from 298 to 343 K with Al:Ti ratios of 0.83 to 16.70. An EPR-2 spectrometer with a klystron wavelength of 3.2 cm and magnetic field modulation frequency of 975 kHz was used to record ESR spectra, an LKhM-8MD chromatograph was used for gas-liquid chromatographic analysis of the gaseous products released during the reaction, and an MI-13-5 mass spectrometer was used to determine the isotope composition of the ethane fraction of the reaction products. The evolution of gaseous products began immediately after the $\text{Ti}(\text{O-n-C}_4\text{H}_9)_4$ and $\text{Al}(\text{C}_2\text{H}_5)_3$ were mixed. About 80% of the reaction in tetraethylene glycol dimethyl ether and anisole at Al:Ti ratios of 10 or

more occurred within 30 to 60 seconds. When all other conditions were equal, the reduction processes occurred more slowly in the anisole medium. The total amount of gaseous products released in the specified time period increased as the Al:Ti ratio and temperature increased. The same pattern was discovered in the cases of Bu_2O and Py. The organotitanium compounds formed from the reaction of $\text{Ti}(\text{O}-n\text{-C}_4\text{H}_9)_4$ and organoaluminum compounds were found to undergo homolytic cleavage at the Ti-C σ -bond. The isotope exchange data gathered by using C_2P_4 pointed to the formation of particles with $\text{Ti}-\text{CH}_2\text{CH}_2-\text{Ti}$, $\text{Al}-\text{CH}_2\text{CH}_2-\text{Al}$, $\text{Al}-\text{CH}_2\text{CH}_2-\text{Ti}$, $\text{M}=\text{CHCH}_3$, and $\text{MM}'\text{CHCH}_3$ (where $\text{MM}' = \text{Al}$ or Ti) fragments. The ESR studies established that the reaction of $\text{Ti}(\text{O}-n\text{-C}_4\text{H}_9)_4$ and $\text{Al}(\text{C}_2\text{H}_5)_3$ in the solvents studied results in two types of paramagnetic complexes that are precursors of active centers of ethylene dimerization. Figures 5, tables 3; references 22: 17 Russian, 5 Western.

Metal Complexes in Catalytic Transformations of Olefins. Communication 7. The Nature of Active Centers and the Mechanism of Processes of the Dimerization of Ethylene Into Butene-1 and the Polymerization of Acetylene in the System $\text{Ti}(\text{O}-n\text{-Bu})_4\text{-AlEt}_3$ in a Medium of Esters

927M0241C Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No 7, Jul 92 (manuscript received 6 Jun 91) pp 1526-1535

[Article by D.B. Furman, L.N. Russiyan, V.N. Noskova, A.P. Lisitskaya, O.V. Bragin (deceased), and P.Ye. Mamkovskiy, Organic Chemistry Institute imeni N.D. Zelinskiy, Russian Academy of Sciences, Moscow; UDC 547.313.2.2:66.095.264.3:541.127]

[Abstract] The formation and nature of the active centers of composites of ethylene and the polymerization of acetylenes in the system $\text{Ti}(\text{O}-n\text{-Bu})_4\text{-AlEt}_3$ were studied in a medium of $(\text{Bu})_2\text{O}$. Experiments were conducted to determine the dependence of the conductivity of the system $\text{Ti}(\text{O}-n\text{-Bu})_4\text{-AlEt}_3$ in a medium of $(\text{Bu})_2\text{O}$ on reaction time (19 to 180 minutes), Al:Ti ratio (24.0 and 34.5), and temperature (313 to 353 K) under model conditions and during the dimerization of ethylene. A Ye6-3 thermoammeter in a thermostatted cell with coaxially configured cylindrical platinum electrodes was used to measure the resistance of the study solutions. The solutions were stirred in an electromagnetic mixer and by bubbling dry argon through. All of the catalyst-metering and -mixing operations were performed in an inert atmosphere. No correlation was found between the rate of ethylene dimerization and the conductivity of the reaction medium, thus indicating the absence of ionic stages in the dimerization process. The effect of olefins and acetylenes on the formation and behavior of K-1 and K-2 paramagnetic centers was also examined. In the absence of ethylene at 333 K and with low Al:Ti molar ratios (≤ 2.5), only K-1 centers form. Increasing the Al:Ti ratio to between 5.0 and 50.0 facilitates the accumulation of K-1 centers and their subsequent consumption to form K-2 centers. As the Al:Ti ratio increases,

both the time required to reach a maximum concentration of K-1 centers and the duration of the induction period decrease. In the presence of ethylene and an Al:Ti ratio of 34.5 only K-1 centers are detected; however, the accumulation of K-1 centers in the dimerization process passes through a maximum just as when ethylene is absent. When the Al:Ti ratio is reduced to 24, the formation of a relatively small number of K-2 centers along with the K-1 centers is observed. The K-1 centers are evidently precursors to K-2 centers, which are in turn transformed into active centers of the dimerization of ethylene to butene-1 (this transformation is evidently due to the effect of the monomer). The oxidation complexing of acetylene and phenylacetylene to $\text{Ti}(\text{I})$ evidently results in the formation of a carbon-center radical that undergoes further transformations to form butene-1 or polyacetylenes, a paramagnetic complex, and diamagnetic products. The proposed mechanism of the dimerization of ethylene into butene-1 with the intermediate formation of titanium cycles is hypothesized to occur only in systems in which the metal is in a low degree of oxidation and thus capable of being oxidized by olefin to form mono- and bimetal cycloalkane complexes. Figures 3, tables 2; references 14: 10 Russian, 4 Western.

Louis Acid Catalysis Under High Pressure as a Method of Involving Hindered Steroidal Dienophiles in the Diels-Alder Reaction

927M0241D Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No 7, Jul 92 (manuscript received 15 Oct 91) pp 1622-1627

[Article by I.S. Levina, L.Ye. Kulikova, A.V. Kamenitskiy, B.S. Elyanov (deceased), and Ye.M. Gonnikberg, Organic Chemistry Institute imeni N.D. Zelinskiy, Russian Academy of Sciences, Moscow; UDC 542.97:542.953:541.12.034:547.92]

[Abstract] The Diels-Alder condensation of dienophiles that would normally be sterically hindered and nonreactive under the conventional conditions of a Diels-Alder reaction was studied in the presence of 0.3 to 1.0 mol.-Eq AlCl_3 under a pressure of 5 to 15 kbar. 16-Methyl- $\Delta^{16,20}$ -ketone and Δ^1 -3-ketone, while completely inert in a Diels-Alder reaction with butadiene and also inert when combined with a Louis acid at pressures below 15 kbar and temperatures up to 180°, became reactive when the condensation temperature was increased to 220° and the pressure was increased to 14-15 kbar. Under the said conditions, the starting steroidal molecule was totally destroyed. The reaction proceeded in the desired direction with close-to-quantitative yields when the starting steroidal dienophiles were subjected to the combined effects of 0.3-0.4 mol.-Eq AlCl_3 and a pressure of 14-15 kbar. When larger amounts of catalyst (up to 0.8-1.0 mol.-Eq) were used, it was possible to reduce the pressure to 5 kbar without changing the yield of end products. All of the [2+4]-cyclocomplexings of dienes to $\Delta^{16,20}$ -, Δ^1 -3-3-, $\Delta^{1,4}$ -3-, and $\Delta^{4,6}$ -3-ketones attempted under the above pressure and temperature conditions in the presence of Louis

acids occurred stereospecifically with the formation of one stereoisomer for each cycloadduct. All of the steroidal dienones studied yielded a mixture of two monocycloadducts at both steroid double bonds with the preponderance of the adduct at the less sterically impeded double bond (Δ^1 - and Δ^6 -). The new method was recommended for use in producing various modified steroids with possible hormonal or antihormonal activity. Table 1; references 12: 5 Russian, 7 Western.

New Highly Effective Olefin Polymerization Catalysts

927M0243B Moscow *KHIMICHESKAYA*
PROMYSHLENNOST in Russian No 5, May 92 pp 262-266

[Article by V.A. Zakharov; UDC 66.095.264.3.002.237]

[Abstract] Catalysts intended for use in the olefin polymerization process must meet eight basic requirements. Specifically, they must possess a high catalytic activity, an optimal morphology and narrow granulometric profile, and an elevated stereospecificity. They must allow for regulation of the polymer's molecular mass, molecular-mass distribution, and the structure of the copolymers. Finally, the process used to manufacture the olefin polymerization catalysts must be reliable, and the catalyst's properties must conform to the technology of the polymerization process. A large number of different catalysts are now being used throughout industry to polymerize olefins. They may be classified into four groups: 1) Ziegler-type heterogeneous catalysts, 2) applied chromium-containing catalysts, 3) applied organometallic catalysts, and 4) Ziegler-type homogeneous catalysts. Researchers at the Catalysis Institute of the Siberian Department of the USSR Academy of Sciences, the Catalysts Special Design and Technology Office, the ONPO [not further identified] Plastpolymer, and several other organizations have jointly developed a series of new catalysts for use in the olefin polymerization process. The following are among the ones recommended for use in industrial practice: IKT-8-11 titanium-magnesium catalyst for the production of linear low-density polyethylene under high pressure by polymerization in a solution; IKT-8-12 applied titanium-magnesium catalyst and IKT-8-13 vanadium-magnesium catalyst for suspension polymerization of ethylene; IKT-8-14 applied titanium-magnesium catalyst for propylene polymerization; IKT-8-15 titanium-magnesium catalyst and IKT-8-18 vanadium-magnesium catalyst for gas-phase ethylene polymerization; and IKT-8-17 and IKT-8-19 applied catalysts for the production of amorphous copolymers based on ethylene, propylene, and α -olefin. All of these new catalysts have proved to be effective in accomplishing the specific purpose for which they were developed and to meet the aforementioned requirements for a good olefin polymerization catalyst. References 31: 4 Russian, 27 Western.

Development and Model Tests of Method for Catalytic Purification of Acrylonitrile Impurities From Gases

927M0243C Moscow *KHIMICHESKAYA*
PROMYSHLENNOST in Russian No 5, May 92 pp 273-275

[Article by V.M. Vlasenko, S.A. Solovyev, G.M. Belokleytseva, S.A. Marusyak, and V.Ya. Volfson; UDC 66.074.385]

[Abstract] The manganese oxide catalyst MKP-1, which was developed at the Physical Chemistry Institute imeni L.V. Pisarzhevskiy of the Ukraine Academy of Sciences, has been incorporated into a catalytic-adsorption method of removing phenol, formaldehyde, styrene, and other organic substances from stack gases that is now being used at a number of enterprises. More recently, MKP-1 has been studied to assess its effectiveness in the catalytic purification of acrylonitrile from gases. The studies were conducted under laboratory conditions on a catalyst with granules ranging from 0.25 to 0.5 mm in size. The test parameters were as follows: space velocity, 20,000 h⁻¹; temperature, 30 to 90°C; concentration of acrylonitrile in the air, 122 mg/m³; and moisture content of the reaction gas mixture, 1 x 10⁻³% (drying by dry ice) and 2.09% (50% humidity at 28°C). The dynamic sorption capacity of the contact with acrylonitrile was not temperature dependent and amounted to about 4 mg per 1 g contact. The amount of acrylonitrile adsorbed did not exceed 10% of the adsorption capacity and decreased as the temperature increased. At 80°C virtually all the acrylonitrile was sorbed irreversibly. The use of MKP-1 to remove MKP-1 from gases thus proved to only be feasible with small volumes of gaseous wastes and low acrylonitrile concentrations. Further tests were conducted to determine the feasibility of using MKP-1 along with the palladium-manganese catalyst PMK-0.25, which is one of the lowest-temperature catalysts available to remove different organic compounds from gases. The model tests established that with acrylonitrile concentrations of 1 mg per m³ gaseous wastes, the combined use of the catalysts MKP-1 and PMK-0.25 results in total removal of the acrylonitrile at temperatures of 160 to 180°C with a space velocity of 10,000 h⁻¹. The catalysts were thus recommended for use in industrial practice because they do not contain significant amounts of noble metal (palladium) and proved to be more active than the palladium contact MA-15. Figure 1, tables 4; references 9 (Russian).

The Effective Heat Conduction of a Hydrocarbon Conversion Catalyst

927M0243E Moscow *KHIMICHESKAYA*
PROMYSHLENNOST in Russian No 5, May 92 pp 298-299

[Article by D.L. Astanovskiy, V.P. Kiyashova, S.I. Glumova, T.A. Semenova, and S.Kh. Yegeubayev; UDC 536.2]

[Abstract] The effective heat conduction of a hydrocarbon conversion catalyst was determined in a study of catalyst granules in the shape of a right cylinder whose ends are perpendicular to its longitudinal axis. The catalyst granules were prepared in accordance with the process used to prepare type GIAP-3-6N catalyst. The granules' effective heat conduction was determined by a nonstationary method under conditions of the regular thermal regimen developed to find the heat conduction of a continuous catalyst. Six specimens were tested. Four of the specimens were impregnated with a solution of nitric acid salts of nickel and aluminum, and two were not impregnated. Instead, 7.2% NiO was applied to them. At least three or four measurements were averaged

to determine the heat conduction of each of the specimens at a series of temperatures ranging from about 20° C to about 450° C. The effective heat conduction of the impregnated catalysts was about 12% lower than that of the catalysts with the applied NiO. This difference was attributed to fact that NiO is characterized by a higher heat conduction than Al₂O₃. The scattering of the experimental points plotted for the entire series of measurements did not exceed 3-4%. Effective heat conduction was found to a linear function of temperature: $\lambda_{\text{eff}} = 2.25 + 0.002t$, where t = temperature. The proposed method of calculating heat conduction and the equation developed for use with it were found to result in a maximum arithmetic mean relative error of about 4% when used with hydrocarbon conversion catalysts. Table 1; references 5 (Russian).

Effect of Water Vapor on Catalytic Oxidation of Hydrogen Sulfide With Oxygen

927M0251A St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 21 May 89) pp 2250-2252

[Article by T. G. Alkhasov, L. L. Aronova, O. Ye. Filatova, Azerbaydzhani Industrial University imeni M. Azizbekov; UDC 661.217.66.097.3]

[Abstract] Selective oxidation of hydrogen sulfide by air oxygen to elemental sulfur over solid catalyst is one of the most promising methods for purification of gases when the concentration of H₂S does not exceed 3 mole-%. As a rule, such gases may contain considerable amounts of water vapor and the latter may offset the catalytic oxidation of H₂. Therefore an investigation was undertaken of the effect of water vapor on the oxidation of H₂ over KS-1 and KS-1y catalysts. It was shown that water vapor decreases total conversion of hydrogen sulfide and its inhibiting action is directly related to the catalyst. Apparently there are two ways in which water vapor can affect the catalytic oxidation. First, water vapor can block active centers of the catalyst by being adsorbed on it; then water can react with sulfur forming hydrogen sulfide and sulfur dioxide. The latter may be quite substantial at temperatures over 300°. Tables 3; references 3: 2 Russian (1 by Western authors), 1 Western.

Investigation of Palladium Ion Exchange Kinetics on Ion Exchange Resins in Solution After Hydrochlorination of Spent Palladium Containing Catalysts

927M0251D St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 9 Jan 91) pp 2365-2369

[Article by O. N. Kononova, A. G. Kholmogorov, S. N. Ilichev, Ye. V. Mikhlin, L. V. Krasnova, L. V. Burakova, Krasnoyarsk State University, Institute of Chemistry and Chemical-Metallurgical Processes, Siberian Division of USSR Academy of Sciences; UDC 546.41:541.183]

[Abstract] Sorption kinetics of palladium from hydrochloric solutions of hydrochemical leaching of palladium containing catalysts was studied using ampholyte and ion exchange resins. Specifically, the following reagents were studied: anion exchange resin AN-251 (a copolymer of divinylbenzene and vinylpyridine) and aminophosphoric ampholytes ANKP-1 and ANKP-5 containing amino- and phosphate groups capable of complexing platinum ions. The experimental curves indicated that the ion exchange of palladium follows a diffusion mechanism through the grains of the exchange resin. Evaluation of the effect of salt composition of the solution, physical structure of the anion exchange resin and of the temperature showed this saturation of the anion exchange resin to occur by a layer-by-layer mode: while the surface layers become fully saturated, the internal ones are not yet accessible to ionic exchange; physical structure of these sorbents does not assure their saturation with PdCl₄²⁻. And yet, the results obtained indicate that the tested materials could be recommended for concentration of palladium from the solution of hydrometallurgical processing of aluminum-palladium catalysts. Figures 7; references: 5 (Russian).

Pilot Investigation of Dehydrogenation Process of C₄ Hydrocarbons Into Butadiene in an Ascending Stream of Finely Dispersed Oxide Catalyst

927M0251F St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 15 May 89) pp 2384-2388

[Article by V. I. Voznyuk, L. P. Shapovalova, T. V. Lysukho; UDC 547.214:542.941.8:541.128]

[Abstract] Investigations of physical-chemical and catalytic properties of oxide catalysts based on metal molybdates showed them to be very active in oxidative dehydrogenation of paraffine hydrocarbons. In order to make them more effective, technological modification must be developed for limited contact with the catalyst in the dehydrogenation zone. Dehydrogenation of C₄ hydrocarbons was investigated in an ascending stream of a complex oxide catalyst using argon and nitrogen as diluents; effect of temperature, dilution of the starting materials with the inert gases and of the composition of C₄ fractions was evaluated. It was shown that with a contact time of 1.1-1.4 s, a 1:3 dilution of n-butane, a 3/15 mole/mole catalyst density in a 200-250 kg/m² stream and temperature ranging from 620-660°, a butadiene yield increase from 10.7 to 20% can be achieved. Thus dehydrogenation of n-butane in a moving layer of an oxide catalyst yields butadiene in a one stage process with improved yield of the end product. Table 1; figure 1; references 12: 11 Russian, 1 Western.

Cobalt-Chromium Spinel Catalyst for Exhaustive Oxidation of Ethyl Chloride

927M0251G St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 4 Apr 91) pp 2388-2393

[Article by V. M. Vlasenko, L. F. Feshchenko, V. L. Chernobryvets, Institute of Physical Chemistry imeni L. V. Pisarzhevskiy, Ukrainian Academy of Sciences; UDC 541.128]

[Abstract] Ethyl chloride, which forms in many industrial processes of chloro-organic synthesis, pollutes the atmosphere and must be removed from the exhaust gasses. One of the possible methods of such removal is based on oxidation of ethyl chloride to carbon dioxide, water and chlorine or hydrogen chloride over expensive catalysts. Recently it was shown that cobalt, iron or copper chromites oxidize ethyl chloride at moderate temperatures, but their mechanical strength is inadequate for industrial applications often resulting in crumbling of the pellets which block the flow of gases. In the present work results were reported on evaluating cobalt chromite catalyst over γ -aluminum oxide used as a carrier. The reaction was studied in temperature range of 250-425° and a reagent flow of 2500 hr⁻¹. It was shown that the following were the optimal conditions for this process: catalyst containing 20% cobalt chromite, temperature: 425-450°; the conversion of ethyl chloride was then quantitative. The catalyst is very active, stable and shows excellent mechanical strength. Tables 3; figures 3; references: 6 (Russian).

Cracking and Aromatization of C₆-C₁₀ n-Alkanes and n-Alkenes Over Zeolite Containing Catalyst

927M0251H St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 22 Oct 90) pp 2396-2400

[Article by T. M. Gayrbekov, M. I. Takayeva, S. N. Khadzhiyev, A. K. Manoyan, Groznyy Petroleum Institute; UDC 547.21:665.656.6:661.183.6]

[Abstract] Reactions of individual C₆-C₁₀ n-alkanes and n-alkan-1-enes were investigated over a zeolite type catalyst ZSM modified with 1% zinc in γ -Al₂O₃ at 425°. Experiments were run on a laboratory scale. Under such conditions the hydrocarbons underwent cracking and aromatization forming C₁-C₄ hydrocarbons and C₆-C₉ arenes. A reverse relationship among the starting materials was noted concerning their reactivity during the cracking process and aromatization in relationship to the molecular weight of the starting hydrocarbons. The primary reaction products in this conversion of n-alkanes are low molecular weight C₂-C₄ olefines and some C₂-C₄ paraffines; the formation of arenes and coke is secondary. Reactions of N-alkenes produce only C₂-C₄ olefines as the primary products; all other products are secondary. The paraffine/olefine ratio in gaseous cracking products drops from 3.0 to 1.4 as the molecular weight of the alkanes increases; in case of the n-alkenes, the ratio is practically constant at 0.2-0.3. The data thus indicate that the conversion of these n-alkanes and n-alkenes goes through different intermediate carbon cations. Evidently cracking represents the first stage of

the principal aromatization reactions. Table 1; figures 3; references 13: 10 Russian (3 by Western authors), 3 Western.

Effect of Thermal Treatment Conditions on Characteristics of Sulfate Catalysts

927M0251I St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 5 May 91) pp 2417-2420

[Article by V. A. Markov, Iozef Tikhii, Milan Vilchek, Ye. I. Dobkina, S. M. Kuznetsova, A. M. Larionov, Technological Institute, St. Petersburg, UDC 541.128.3]

[Abstract] Introduction of activating additives improves the properties of sulfate catalysts. Often it is necessary to determine the distribution of the active modifiers through the catalyst granules. This distribution depends on the method of their introduction and on the conditions of thermal treatment they receive. Mixed vanadium catalysts for conversion of sulfur dioxide were investigated. Evaluation of the microanalytic data showed that the distribution of elements in the granules is not uniform. The components seem to intermix and this process intensifies with the rise in temperature; areas of preferential concentrations of potassium-sulfur and vanadium-cesium exist. Therefore, when soft conditions of calcination are used, the non-uniformly distributed elements will play an important role in the activity of the catalyst. Table 1; figures 3; references: 5 (Russian).

Chemical Reactions Among Components of Catalytic Coatings Over Metallic Carriers

927M0251J St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 16 Oct 90) pp 2420-2423

[Article by R. Kh. Mukhutdinov, N. A. Samoylov, Ufa Petroleum Institute; UDC 621.391:66.023]

[Abstract] The goal of this work was to evaluate the reactivity of a catalyst which the authors developed from a commercial oxide catalyst, technical calcium aluminate and a toluene solution of polymethylphenylsiloxane resin taken at a 1:1:2 ratio. This catalyst cover was deposited on steel plates and treated at 100-600° for different time periods. The polymethylphenylsiloxane macromolecules provided a strong elastic network keeping the catalyst particles on the surface of the metallic carrier. A direct relationship was established between the mechanical strength of this cover and the content of oxygen in the catalyst. The reaction rate constant was calculated for the interaction between the resin and the oxide catalyst particles. The mechanical strength of the catalyst cover could be predicted from the minimal bending radius values. Table 1; figures 4; references: 7 (Russian).

A Strategy for Developing Russia's Chemical Industry*927M0243 Moscow KHIMICHESKAYA**PROMYSHLENNOST in Russian No 5, May 92 pp 259-261*

[Article by A.I. Salin, General Director, Department of the Chemical and Petrochemical Industry, Russian Federation Ministry of Industry]

[Abstract] From 1975 to 1985 Russia's chemical complex grew by a factor of 2.5 while industrial production overall increased by a factor of 2. Russia now produced nearly 16 million tons of mineral fertilizers, 13 million tons of sulfuric acid, 3 million tons of calcined soda, 2 million tons of synthetic rubbers and paints and varnishes, and 3 million tons of synthetic resins and plastics. Big gains have been achieved in the production of the most progressive types of products, e.g., synthetic fibers, synthetic rubbers and plastics, and radial tires. Advances were also made in the high-capacity production of such important chemicals as ammonia, nitric, carbamide, high-pressure polyethylene, and polypropylene. Positive (albeit small) shifts in the territorial structure of the chemical industry have also occurred, although the Central, Volga, and Ural regions still account for 55% of the republic's total chemical production. Despite these gains, the demand for the most important chemicals is still far from being met. Existing facilities are not nearly being used to capacity, and the start-up of new facilities is slow. Lengthy construction periods (10 to 15 years) are also slowing technical progress. About 7 billion rubles' worth of construction

currently remains uncompleted. The Department of the Chemical and Petrochemical Industry hopes to privatize most of these facilities without altering their profiles. The remaining facilities will require centralized capital investments. The social consequences of privatization are receiving special attention: measures are being taken to support social stability in labor collectives and to preserve the unique experience of the sector's industrial, scientific, and managerial personnel. Environmental and ecological concerns are being addressed, and steps are being taken to acquire low- and no-waste technologies and cooperation from Western firms in modernizing the country's chemical industry. Although private Western firms cannot solve all of the Russian chemical industry's problems, they can offer important assistance in helping it develop a market economy and market structures. The basic direction of a joint investment strategy to develop Russia's chemical industry in the future may proceed according to a two-stage plan. The first stage (up to 1995) will include the completion of all construction that has been started, the use of uninstalled equipment (mostly imported), and radical redesign of a number of production processes (especially the production of caustic soda and chlorine products; calcined soda and inorganic products; and selected types of plastics, rubbers, and chemical fibers). The second stage (after 1995) will include construction of new enterprises (especially in areas in which hydrocarbon resources are located, i.e., Western Siberia, the Caspian region, and the Sakhalin Oblast) and further development of the country's scientific potential (to be financed by withholdings in the amount of 1.5% of enterprises' production costs).

Ways of Improving Thermal Processing of High-Ash Oil Shales

927M0207B Moscow KHIMIYA TVERDOGO
TOPLIVA in Russian No 1, Jan-Feb 92 (manuscript
received 13 Mar 91) pp 55-61

[Article by I.I. Lishtvan, K.B. Martinovich, P.L. Falyushin, G.I. Morzak, and N.V. Rutkovskaya, Natural Resources Utilization and Ecology Problems Institute; UDC 662.73:662.67]

[Abstract] The high-ash oil shales of the Pripyat Basin represent a large raw material base of fuel and energy resources for the Belarus economic region. Existing enrichment methods cannot use the oil shales to produce concentrates with a high kerogen content owing to the strong bond between the organic matter and mineral mass in the shales. In an effort to develop a way of making the use of Pripyat Basin oil shale economically feasible, researchers from the Natural Resources Utilization and Ecology Problems Institute in Belarus studied a sample of Pripyat oil shale with the following characteristics (%): ash content, 78.1; equivalent organic matter content, 16.2; carbonates' carbonic acid content, 3.7; and moisture content, 4.5. The ash portion of the sample contained the following (%): SiO_2 , 49.7; Fe_2O_3 , 12.8; Al_2O_3 , 17.6; CaO , 2.5; K_2O , 5.1; SO_2 , 3.8; MgO , 1.8; P_2O_5 , 0.3; TiO_2 , 1.2; and Na_2O , 0.3. Oxides, hydroxides, and various salts (chlorides, sulfates, carbonates, and silicates) were used as catalytic additives. Chlorides of group I, II, and III metals were found to be the most effective additives. Significant increases in tar yield were achieved in the presence of CaCl_2 , BaCl_2 , and FeCl_3 (29, 49, and 34%, respectively). The gas resulting from the thermal decomposition of shale with metal chloride additives contained elevated (by a factor of 2 to 2.5) amounts of unsaturated hydrocarbons, elevated (albeit not as much) amounts of CO_2 , and a reduced amount of CO . Intensive formation of CH_4 and H_2 was observed in the presence of FeCl_3 , ZnCl_2 , and NaCl . The release of CO_2 and CO from the oil shale during thermal decomposition occurred at temperatures 50°C below that when no additives were used. Thermolysis of the oil shale in the presence of mineral additives (sulfates, carbonates, chlorides, zeolites, etc.) was also studied. A significant increase in tar and gas yield in the presence of chloride-containing minerals (bischofite and carnallite) was discovered. When added in amounts of 5 to 15%, they increased tar yield by 10 to 30%. Radiation, ultrasound, and magnetic effects were also tested as ways of weakening the bonds of the organic-mineral complexes in the shale's structure before thermal processing. Exposing the oil shale to an eddy magnetic field resulted in a 15-20%

increase in tar yield, and ultrasound and radiation treatment each resulted in a 20% increase. Organogenic additives also proved to be promising. Tables 5; references 6 (Russian).

An Ecological-Economic Evaluation of the Creation of a No-Waste Process for Producing Pentaerythritol

927M0243D Moscow KHIMICHESKAYA
PROMYSHLENNOST in Russian No 5, May 92 pp 275-277

[Article by V.A. Daut; UDC 661.725.817.1:504.06]

[Abstract] Each year about 35,000 tons of pentaerythritol is produced in the former USSR. Between 2 and 5 tons of liquid wastes is generated per ton of pentaerythritol produced. The wastes are an aqueous solution of 8% pentaerythritol, 18% sodium formate, and 12% organic compounds consisting of pentaerythritol derivatives and aldehyde condensation products. A no-waste process for producing pentaerythritol has been developed by a team of specialists at the Metanol Production Association in Gubakhin and the Novosibirsk Scientific Research Institute of Chemical Technology. In essence, the wastes are diverted to processing to remove the pentaerythritol and sodium formate. Part of the sodium formate is then further processed into formic acid, which is returned to the pentaerythritol production process, while the rest of the sodium formate and the tertiary mother liquor is left in liquid form or else reprocessed depending on clients' needs. Introduction of the new no-waste process at the production association resulted in a boost in its economic indicators: formalin and acetaldehyde consumption was reduced by 30%, and the recovered sodium formate made it possible to completely halt the purchase of imported formic acid. A formal economic and ecological evaluation of the impact of the new no-waste process at the Metanol Production Association was conducted. The estimates established that were it not for the new no-waste process, the production of 6,380 tons of pentaerythritol at the plant in 1990 would have resulted in 31,900 tons of wastes (versus no wastes thanks to the new process). Similarly, estimates of the possible versus actual economic losses incurred from the dumping of wastes at the production association in each of the years from 1985 through 1990 established that the new process resulted in a savings of 5,433,200 rubles in 1990 (no losses were incurred versus the 5,433,200 that would likely have resulted before the new process). The total cost savings resulting from the new process (i.e., the reduction in losses resulting from the generation of process waste plus the value of the recovered and recycled materials) was estimated at $2,577,760 + 5,433,000 = 8,010,760$ rubles. Figures 2, table 1; references 3 (Russian).

An Electrochemical Method of Marking Products

927M0244C Moscow *KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE* in Russian No 8, Aug 92 pp 32-33

[Article by R.F. Kudryashova; UDC 62-777:621.9.047.7]

[Abstract] The process of applying information onto products, i.e., marking them, may be treated as a part of the actual manufacturing process or as an independent operation. The photochemical method of marking that is currently used most often is laborious, requires the use of toxic materials, and does not guarantee that the information marked on products will remain on them as they are used. Researchers at the VNIITnasosmash [not further identified] have developed an electrochemical method of applying various pieces of information (including tabular information) that is not fraught with the shortcomings of the photochemical method. The new electrochemical marking unit is based on the use of an electrode-tool. Marks are applied in a single pass of the electrode-tool in 1 to 2 seconds. The entire marking cycle, including the operations of bringing the electrode-tool to the product to be marked and then withdrawing it only takes 5 to 6 seconds. A process has also been developed to manufacture the electrode-tools by the zincography method, which makes it possible to produce electrode-tools bearing any image that has been pre-drawn on paper or that has been photographed. The electrolyte used in the process consists of 0.6 to 1%

NaNO_3 , 4 to 8% NaNO_2 , and 2.5 to 6.5% $\text{K}_4[\text{Fe}(\text{CN})_6]$. 12Cr18Ni9Ti steel (0.25 mm thick) is used for the nameplates. Figure 1.

Electrochemical Reduction of Oxygen on Soot in Alkaline Medium

927M0251B St. Petersburg *ZHURNAL PRIKLADNOY KHIMII* in Russian Vol 64 No 11, Nov 91 (manuscript received 7 May 91) pp 2297-2301

[Article by N. V. Chayenko, G. V. Korniyenko, T. L. Pustovalova, V. L. Korniyenko; Institute of Chemistry and Chemical- Metallurgic Processes, Siberian Division of USSR Academy of Sciences; UDC 541.138.3:661.491.123.7]

[Abstract] In an attempt to find indicators for a behavior of carbon material during electrochemical reduction of molecular oxygen to the hydroperoxide ion, electrochemical properties and catalytic activity of soot samples P 805-E, P 602, P 702 and P 399- ET were compared. These samples differed by their specific surface, composition of the surface groups, particle size and surface purity. Based on the polarization curve obtained during reduction of O_2 , a conclusion was reached that the reaction went almost exclusively in the direction of the formation of the hydroperoxide ion; this selectivity occurred markedly during the first hour of the operation. Two of the samples tested: P 805- E and P 399-ET exhibited marked resistance to wetting and a rather stable performance characteristic. They have been recommended as materials suitable for electrolytic cathode reduction of molecular oxygen to the hydroperoxide ion. Tables 2; figures 4; references 12: 10 Russian, 2 Western.

**Synthesis, Study, and Application of
Chelate-Forming Sorbents for Concentrating and
Determining Micro Quantities of Elements in
Natural and Waste Waters**

927M0223B Moscow ZHURNAL ANALITICHESKOY
KHIMII in Russian Vol 47, No 5, May 92 (manuscript
received 5 Dec 91) pp 787-793

[Article by N. N. Basargin, Yu. G. Rozovskiy, and N. V. Chernova, Geology of Ore Bodies, Petrography, Mineralogy and Geochemistry Institute, Moscow; UDC 543.544:546.93]

[Abstract] Methods for direct determination of trace quantities of many elements in waste and natural waters are available for only a few elements. The sensitivity of the flame photometric technique may be increased by concentration from large volumes of water using polymeric chelate-forming sorbents. A feature of these sorbents is the presence of chemically active groups capable of reacting with metal ions present in the water to form chelate complexes. Thus the properties of these sorbents are related to the nature of the functional-analytical groups present in the matrix, and to a certain degree, these properties also depend on the physical and chemical properties of the polymer matrix itself, the properties of the element, and the sorption conditions. In the present work some results are presented on a study of the physical chemical properties of various polymer sorbents having various functional analytical groups and the possibility of applying them for group concentration of heavy metals in natural and waste waters for subsequent flame photometry. Figure 1; references 12: 11 Russian, 1 Western.

**Determining Starting Requirements for
Standardization and Standards Regulating
Emissions From City Enterprises With
Consideration for Data From Observations of
Atmospheric Pollution**

927M0242A Moscow KHIMICHESKAYA
PROMYSHLENNOST in Russian No 6, Jun 92 pp 324-328

[Article by A.S. Belyavskiy; UDC 504.06]

[Abstract] The development of city-specific environmental protection standards for design organizations to follow when designing new enterprises is one of the most important ways of alleviating the critical environmental situation now existing in many cities throughout the former USSR. Despite the importance of such work, existing documents dealing with the methodology of developing standards do not contain any information on the procedures and methods required to make a quantitative determination of permissible limits on wastes generated by enterprises that give consideration to both the atmospheric pollution that will be generated by the planned enterprises and the pollution already being generating by the city's existing enterprises. For a number of reasons, the pollution concentration fields

that are currently used as a basis for establishing atmospheric emission standards do not reflect the true picture of atmospheric pollution in many cities. Any standardization method developed to remedy this situation must reflect three important facts: 1) the current methods of measuring the true pollution level and profile of a city's atmosphere can only be considered suboptimal, 2) a city's overall pollution level and profile must be determined by considering both existing pollution levels and sources and the additional pollution that will be generated by any planned enterprises, and 3) cities attempting to control the pollution of their atmospheres can only hope to regulate those pollution sources that are located within their confines. The author of this article provides a series of 13 groups of formulas for calculating pollution levels in a manner that gives consideration to all of the above factors. He also presents a nine-step procedure for incorporating data from actual observations of fields of maximum ground pollution concentrations and parameters for controlling the quality of the atmosphere of a city (or industrial center or region) into the formulas for setting pollution standards for newly planned enterprises. He also calls for the development and use of city automated pollution control systems containing the following components: a data base inventorying wastes generated by the city's or region's enterprises; an estimate of pollution concentration fields; a data base holding the records of standard observations at observation stations; corrections (approximations) of calculated pollution fields based on actual observations; a system for computer-aided design of emission standards; and a computer-assisted engineering decision-making system that design organizations and enterprises could use to develop alternative engineering solutions. References 11 (Russian).

**The Fire Hazard of Spherical Tanks for Storing
Rarefied Hydrocarbon Gases Under Pressure**

927M0242B Moscow KHIMICHESKAYA
PROMYSHLENNOST in Russian No 6, Jun 92 pp 328-331

[Article by A.P. Shevchuk, Yu.N. Shebeko, I.M. Smolin, A.N. Borodkin, O.A. Simonov, L.V. Gurinovich, S.A. Popov, and V.A. Kolosov; UDC 614.841.2.003.12]

[Abstract] The method of storing rarefied hydrocarbon gas under pressure in spherical tanks has gained widespread popularity. Storage facilities consisting of 12 spherical tanks that each have a capacity of 600 m³ are not uncommon. A theoretical analysis was performed to estimate the fire hazard posed by 12 such spherical tanks (arranged in three four-tank groups) storing rarefied hydrocarbon gas under pressure. The conditions likely to develop given four standard accident scenarios were considered: 1) the accidental leakage of rarefied hydrocarbon gas from a spherical tank in the event of the total rupture of a 309-mm- or 150-mm-diameter pipeline coupled with the formation of a cloud that would explode upon ignition; 2) the accidental leakage of rarefied hydrocarbon gas through a discharge vent and the formation of an explosive cloud; 3) a spill of the

liquid phase of the rarefied hydrocarbon gas into the earth mounding surrounding a group of four tanks, followed by the ignition of the spill and the exposure of the tanks to the resultant heat; and 4) heating of a spherical tank by the thermal radiation of a fire resulting in the rupture of the tank and the formation of a fire ball. The analysis established that the shock wave generated by an explosion would be strong enough to threaten building structures and equipment located up to 100 m from the epicenter of the explosion. It would only take 16 minutes after the outbreak of a fire for the tank walls to reach their critical rupture temperature. The excess pressure resulting in the shock wave at a distance of 100 m from a ruptured spherical tank would not exceed 10 kPa, but fragments of the ruptured tank might fly distances of up to 1.5 km from the explosion site. The fire ball resulting from an explosion of a tank filled with pressurized rarefied hydrocarbon gas might reach 180 m in diameter and might last for 16 seconds. Up to 30 m from its epicenter, the explosion would likely prove 100% lethal. It would prove lethal to more than 50% of those persons within a 43-m radius, and it would be sufficient to ignite heavy canvas clothing at a distance of 67 m, cause second-degree burns at a distance of 115 m, and cause blisters at a distance of 225 m. Only beyond a distance of 225 m would people be safe. A distance of 225 m should thus be considered the minimum safe evacuation distance in the event of the aforementioned types of damage to 600-m³-capacity spherical tanks located in groups of 12. Figures 2; references 15: 7 Russian, 8 Western.

Synthesis of Aluminum Hydroxy Sulfate by Electrochemical Method for Purification of Effluent

927M0251C St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 13 Feb 91) pp 2302-2305

[Article by L. Ye. Sitchikhina, I. V. Gofenberg, Ye. O. Salnikova, Ye. N. Turanina; UDC 638.3]

[Abstract] Precipitation of sulfates from effluent with aluminum chloride or hydroxy chloride leads to secondary pollution of water with Cl⁻ ions. Recently it was shown that aluminum hydroxy sulfide appeared to be a more effective reagent with a number of advantages. Its preparatory method, developed only lately, was not fully satisfactory, therefore an attempt was made to improve it by switching to an electrochemical synthesis. This method yields the hydroxy sulfides with high alkalinity, the equipment needed is simple requiring only easily available electrolytes and electrodes. It was established that optimal concentration of the electrolyte was 5-7% of Al₂(SO₄)₃, and optimal current density: 115-120 A/m². Precipitation of sulfates using this aluminum hydroxy sulfide is a rapid reaction, the process ending in 2-3 minutes. The hydroxy sulfide reagents are quite stable in pH 3.3-3.5; their solutions preserved their activity for up to 6 months, while in the dry state they were active up to a year. Tables 2; figures 3; references: 3 (Russian).

Current Problems in the Production of Phosphorus-Containing Fertilizers (The Creation of New-Generation Manufacturing Systems)

927M0242C Moscow *KHIMICHESKAYA PROMYSHLENNOST* in Russian No 6, Jun 92 pp 332-334

[Article by I.M. Kuvshinnikov, V.G. Kazak, and A.A. Kuznetsov; UDC 661.63.004.14"312"]

[Abstract] The mineral fertilizer industry is currently plagued by three big problems: the ecological safety of the production and use of fertilizers; the urgent need for a big improvement in fertilizer quality (especially the physical properties of fertilizers); and the need to create fundamentally new phosphate-processing systems with high levels of energy and resource consumption efficiency. As it stands now, the fertilizer industry is incapable of producing products with physicochemical and physicomechanical properties meeting the requirements that have been set for phosphorus-containing fertilizers while simultaneously meeting the established goals regarding energy and resource conservation. All three of the above problems are interconnected, and none can be solved without consideration of the impact that any solution proposed may have on the other two problems. For example, the need to mechanize loading and unloading operations and to meter fertilizers and incorporate them into soil has made it necessary to produce fertilizers in granulated and noncaking form. This in

turn has created a wealth of ecological and energy problems because the drying stage is the most ecologically harmful and energy-intensive of the entire fertilizer production cycle. Currently existing fertilizer production processes that include a drying stage call for three entire viscous circles that each include two opposing processes, thus resulting in big unproductive expenditures of energy and resources. Specifically, the existing fertilizer production processes call for heating-cooling, moistening-drying, and drying-moistening cycles. A fundamentally new drying process that eliminates the stage of drying moistened material is needed. Basic research is needed to determine 1) how to remove the water accompanying the phosphoric acid from the salt system so that the fertilizer product does not contain more than 1 to 2% more moisture than stipulated by the standards; 2) whether sufficient plasticity to form granules can be achieved given such a moisture content; and 3) whether granules produced from a starting mixture with a reduced moisture content can be guaranteed to maintain their strength, not cake, and retain a low hygroscopicity. It is clear that the low plasticity of starting mixtures with a reduced moisture content will have to be subjected to a substantial external force; however, extruders capable of exerting the forces required already exist and could, after additional research, probably be modified to meet the specific needs of the phosphorus-containing fertilizer production process. References 5 (Russian).

The Formation of Dimers in a Reaction of Aryl Halides Catalyzed by Nickel Complexes

927M0241E Moscow IZVESTIYA AKADEMII NAUK RAN
SERIYA KHIMICHESKAYA in Russian No 7, Jul 92
(manuscript received 22 Jul 91; after revision 9 Jan 92)
pp 1674-1676

[Article by Yu.G. Budnikova, Yu.M. Kargin, and V.V. Yanilkin, Organic and Physical Chemistry Institute imeni A.Ye. Arbuzov and Kazan Scientific Center, Russian Academy of Sciences, Kazan; UDC 541.13:541.128]

[Abstract] Complexes of Ni(II) with 2,2'-dipyridyl reduced on a mercury electrode in acetonitrile against a

background of 0.1 M Bu_4NBF_4 in a single two-electrode stage to the complex Ni(0) have been shown to result in high yields of diaryls from aryl halides. The possibility of synthesizing the zero-valent Ni catalyst itself by the anodic dissolution of nickel in the presence of 2-bromopyridine in a cell with no separation of the anodic and cathodic spaces was confirmed in an experiment performed with a glassy carbon cathode, acetonitrile as a solvent, and 10^{-2} M Et_4NBr as a background electrolyte. Starting concentrations of 10^{-3} M $\text{Ni}^{2+}(\text{Dipy})_2$ and 3×10^{-1} M aryl halide were used. The catalytic reaction performed resulted in 4,4'-dibutylphosphatediphenyl with a melting point of 210 to 212°. Table 1; references 8 (Western).

A Study of the Chemical Composition and Structure of Fusinite Brown Coals by Products of Their Ozonolysis

927M0207A Moscow KHIMIYA TVERDOGO
TOPLIVA in Russian No 1, Jan-Feb 92 (manuscript
received 17 Apr 91) pp 36-40

[Article by Z.M. Perednikova, Z.A. Romyantseva, and B.B. Gartsman, Chemistry Institute, Tajikistan Academy of Sciences; UDC 662.642:542.943.5]

[Abstract] The chemical composition and structure of fusinite brown coals were studied on the basis of their ozonolysis products. The ozonation was conducted in a glass slurry reactor in chloroform and ozonated air containing 2.5 vol.-% ozone. A flask with a titrated barium hydroxide solution was used to absorb the gaseous products released during the ozonation. The methylated ozonation products were analyzed by infrared spectrometry and chromatography-mass spectrometry. A Finigan-4021 low-resolution chromatography-mass spectrometer was used. The temperature was programmed from 50 to 250° C, helium was used as the gas carrier, and an ionizing electron energy of 70 eV was used. The analysis established that ozone is a superior oxidizing agent for use with brown fusinite coals because it converts up to 90% of the carbon of the coal's organic matter to a soluble state. Comparative studies of the group composition of the ozonation products of non-weathered and weathered coals demonstrated that carbon dioxide is formed primarily from the aliphatic unsaturated structures of nonweathered coal. The infrared spectroscopy studies established the presence of five different types of chemical structures in the organic matter of fusinite brown coal: 1) olefin bond-containing aliphatic and alicyclic structures that are easily oxidized into carbon dioxide; 2) oxybenzene rings that are evidently preserved in the transformed lignin structures and that are easily oxidized to carbon dioxide (together with the olefin structures they constitute about 24% of the carbon of the starting coal); 3) aliphatic structures of long-chain hydrocarbons that account for 26% of the carbon in the starting coal; 4) bi-, tri-, and tetracyclic condensed aromatic structures that yield benzenecarboxylic acids during ozonation and that contain 17% of the carbon in the starting coal; and 5) condensed polynuclear aromatic structures, including polynuclear quinones and ketones, that are not easily oxidized by ozone and whose presence has been established in the water-insoluble ozonation products by infrared spectroscopy (they account for 33% of the carbon in the coal). Figure 1, tables 2; references 5 (Russian).

The Interconnection Between Strength and Porosity and the Conditions of the Impregnation of Filler-Braids of Carbon Materials

927M0207D Moscow KHIMIYA TVERDOGO
TOPLIVA in Russian No 1, Jan-Feb 92 (manuscript
received 31 Aug 90) pp 121-130

[Article by S.A. Kolesnikov, V.I. Kostikov, G.M. Butyrin, and A.N. Borodin, Graphite-Based Building Materials Scientific Research Institute; UDC 66.092.147]

[Abstract] The tensile and shear strength levels of samples of carbon materials were studied in relation to the conditions used to impregnate the filler-braids of the materials. Specimens of the carbon-carbon composite KUP-VM-PU were studied. The effects of the structural peculiarities of different pore spaces on the achievable ultimate strength of the specimens placed under normal bending loads were also studied. The studies performed established that manufacturing carbon-carbon materials by the method of "wet" spinning or by spinning a preparation produced in advance guarantees that the binder will penetrate mainly the interfilament pore spaces of the material, thus resulting in a monolithic composite. Increasing the volume of a carbon-carbon material's micropores ($R_{eq} < 0.5 \mu\text{m}$ in the case of interfilament pores) has a significant effect on reducing strength in the direction of reinforcing the composite, whereas the volume of a carbon-carbon material's macropores (i.e., pores caused by placement of the filler and by its textile form) affects transversal strength and shear strength. The interfilament filling of pores with $R_{eq} < 0.5 \mu\text{m}$ guarantees that maximum strength levels of σ_{11} and τ_{12} will be reached along the composite's main axes. The stability of the retention of the primary binder in pores of the fibrous skeleton measuring $10 < R_{eq} < 20 \mu\text{m}$ penetrate guarantees an increase in strength σ_{22} . Figures 4, tables 3; references 3 (Russian).

Decreased Stability of Optical Quartz Fibers on Removing Polymeric Coating

927M0220A St. Petersburg FIZIKA I KHIMIYA
STEKLA Vol 18 No 2, Mar-Apr 92 (manuscript
received 16 Apr 91) pp 89-95

[Article by L. G. Baykova, T. I. Pesina, V. P. Pukh, N. M. Davidovich, and Ye. N. Radeyeva, Physical Technical Institute imeni A. F. Ioffe, St. Petersburg]

[Abstract] Three-point bend and stretch methods were used to study the stability of quartz optical fibers. Drying the fibers by heating them to 100° C for 6 hours was found to increase stability by 15- 20%. This process was reversed after several hours at normal temperature and humidity, due to absorption of moisture by the epoxy-acrylate coating. Subjecting the fibers to liquid nitrogen at -196° C increased stability by a factor of 2.1. Dissolving the covering using sulfuric acid with strict protection of the bare surface from mechanical contact decreased stability and increased its dispersion. The stability of the fibers from which the coating was removed was similar to that of virgin uncoated fibers. The decrease in stability after coating removal is connected with local structural strain and the development of microcracks due to the action of moisture. Increasing the working surface by stretching the fibers lowered stability and increased its dispersion. The effect of coating removal was less pronounced on fibers of 60-80 μm than on fibers of diameters greater than 100 μm , since the former have a more homogeneous structure. Analogous results were obtained when the fiber coating was removed with acetone at room temperature. The

data obtained indicate that there a wide range of local internal strains in quartz optical fibers, which can lead to the formation of microdefects on removal of the coating or as a result of other physico-chemical factors. Figures 2; references 14: 9 Russian, 5 Western.

Action of γ -Radiation on Light Attenuation in Multicomponent Glass Light Guides

927M0220B St. Petersburg FIZIKA I KHIMIYA STEKLA Vol 18 No 2, Mar-Apr 92 (manuscript received 23 Jul 91) pp 115-121

[Article by P. K. Khabibullayev, G. A. Tavshunskiy, A. P. Glebov, V. M. Demina, Yu. N. Kondratyev, V. P. Kurkin, M. V. Chikhikova, and S. A. Sholkina, Department of Thermal Physics, Uzbekistan Academy of Sciences, Tashkent]

[Abstract] In connection with attempts to elucidate the mechanism of the protective action of cerium ions, studies were conducted on the behavior of optical fibers fabricated from multicomponent germanium-silicon glass containing cerium during and after γ -radiation. Five types of fibers were studied. The first three were prepared under oxidative conditions and contained 0.3, 0.6 or 0.72 mass% cerium. Fiber type four contained 0.6 mass% Ce and was prepared under neutral conditions, while fiber type five contained 0.5 mass% Ce and was prepared under reductive conditions. Types one through four had similar optical loss spectra, while type five had a markedly different spectrum, with greater light attenuation over the entire 600-1600 nm spectrum studied. Samples with 0.6 mass% Ce exhibited higher attenuation than those with higher or lower Ce levels. The γ -radiation dose dependence of the loss demonstrated that for the oxidative samples radiation-induced attenuation decreased with increasing Ce concentration. Radiation sensitivity was less at higher wavelengths. The neutral samples had greater loss in the 1100-1500 nm region. The reductive samples exhibited the least radiation sensitivity at 850 nm. Studies on post-radiation relaxation showed that higher Ce concentrations led to less relaxation loss. Both long-lived and short-lived relaxation components were noted, and both were more marked at shorter wavelengths. Higher Ce concentrations decreased the long-lived component. Heating type three samples to 70-80° C after irradiation lowered attenuation to levels which were only achieved after months at room temperature. Type four samples were only affected by heat at longer wavelengths. Heating type five samples to 300 K also sharply decreased attenuation. Figures 3; references 6: 5 Russian, 1 Western.

Voltamperimetric Determination of Trace Amounts of Chromium in Gallium Arsenide

927M0223D Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 47, No 5, May 92 (manuscript received 3 Sep 91) pp 890-895

[Article by M. Vanichkoova, Ya. Labuda, and Ye. Gofbauerova, Slovakian Technical University, Bratislava]

[Abstract] Chromium plays an important role in the technology of preparing gallium arsenide. This substance normally contains 1-2 nanograms of Cr per gram, while in a doped semiconductor it varies from 2 to 10 micrograms per gram. In the present work an inversed-voltamperimetric method was developed for determining chromium in gallium arsenide that is based on adsorption stripping Cr(III)-diethylenetriaminepentaacetic acid complex on a mercury electrode followed by reduction of the complex and utilization of nitrate-ion catalytic current. Differential pulsed polarography also was confirmed as a method for use in alkaline solution for determination of Cr in GsAs samples containing in excess of 3 micrograms per gram. Figures 3; references 10: 2 Russian, 7 Western.

Resonance Interaction of Reflected Waves with Acute Asymmetric Diffraction on Superlattices

927M0226A Moscow KRISTALLOGRAFIYA in Russian Vol 37 No 1, Jan-Feb 92 (manuscript received 10 Nov 89) pp 43-50

[Article by A. P. Ayvazyan, Yerevan State University; UDC 548.732]

[Abstract] The problem of diagnosing the structure and degree of perfection in laminar systems and superlattices is becoming more pressing as a result of the strong tie between the electrical and physical properties, and the type and quality of structure. The possibilities of X-ray diagnosis in resolving this problem are governed by the fact that modulations in composition result in deformational modulations, which have a significant effect on the shape of the diffraction curve. However, with the exception of symmetric or only slightly asymmetric diffraction systems, the properties of superlattices as diffracting objects have not been studied sufficiently. An acute asymmetric diffraction scheme was proposed and theoretically developed in a previous work, and intensity computations indicated that under certain conditions of acute asymmetric diffraction, satellite peaks of a diffracted wave are accompanied by a resonant intensification of the mirror-reflected wave. The purpose of the present work was to make a physical interpretation of this effect and determine the conditions causing it by studying X-ray diffraction in superlattices. A theoretical foundation was made for the resonant intensification effect in a mirror-reflected wave under conditions of acute asymmetric X-ray diffraction in superlattices. An expression was derived which describes the conditions producing resonance, and a physical interpretation of the effect is presented. Figures 5; references 13: 6 Russian, 7 Western.

Estimation of Distortion Elasticity and Residual Stresses of Yttrium-Aluminum Garnet

927M0226B Moscow KRISTALLOGRAFIYA in Russian Vol 37 No 1, Jan-Feb 92 (manuscript received 21 Feb 91) pp 177-183

[Article by E. L. Lube, A. T. Zlatkin, Kh. S. Bagdasarov, Ye. A. Fedorov, N. V. Tarasova, and A. V. Bologova, Crystallography Institute imeni A. V. Shubnikov, Moscow; UDC 548.0:539]

[Abstract] Residual stress level and distortion elasticity are important characteristics of crystals needed to determine the conditions required for cutting, grinding, and polishing crystals for use in various devices and in predicting the reliability of these devices under mechanical and thermal loads during service. Residual stress and distortion elasticity of a crystal depend greatly on the conditions under which the crystal was grown, and the amount and uniformity of distribution of any impurities. The determination of these values, along with in situ control of crystal perfection, makes it possible to optimize the growing process. In the present work residual stress and distortion elasticity were determined in yttrium-aluminum garnet crystals by a method based on indentation of the crystal and measuring the resultant acoustic emissions. Relationships between the two values were studied. Figures 4; references 4: 3 Russian, 1 Western.

Computerized Simulation of Relative Arrangement of Molecules in Cholesterol Liquid Crystal Phase

927M0226C Moscow KRISTALLOGRAFIYA in Russian
Vol 37 No 1, Jan-Feb 92 (manuscript received 7 Mar 91)
pp 184-188

[Article by I. L. Dubchak, T. V. Timofeyeva, A. P. Polishchuk, and Yu. T. Struchkov, Elementoorganic Compounds Institute, Moscow; Physics Institute, Kiev; UDC 548.0:532.783]

[Abstract] According to the spiral structure theory of liquid crystals, it is assumed that the basic reason for the "twisting" of liquid crystal molecules is the chiral nature of intermolecular interactions caused by the presence of one or more chiral sites in the molecule. However, those factors affecting the pitch of the spiral in a system of ordered chiral molecules have not yet been fully clarified on a molecular level. For this purpose, a computerized simulation operating with realistic molecular structures as determined by X-ray diffraction of mesogenic crystals, can be very useful. In the present work atom-atom approximation was used to compute the arrangement of cholesterol benzoate molecules in stacks having approximated translational, or 2_1 symmetry. It was demonstrated that the molecules in these associates are not arranged in a strictly parallel configuration, but with a certain dislocation which imparts a spiral nature to the arrangement of molecules in a stack. The type of sub-molecular organization in crystals is compared with isolated stacked associates of cholesterol benzoate. Figures 2; references 15: 6 Russian, 9 Western.

Magnetoreflexion of Birefringent Crystals

927M0226D Moscow KRISTALLOGRAFIYA in Russian
Vol 37 No 1, Jan-Feb 92 (manuscript received 25 Mar 91)
pp 215-217

[Article by N. A. Ivzhenko, E. P. Kolesnikova, G. I. Kudin, and I. D. Lomako, Kiev Polytechnical Institute; Solid State Physics and Semiconductors Institute, Minsk; UDC 535.341.08]

[Abstract] The Kerr equatorial effect in magnetics has been studied previously and a method for determining non-diagonal components of the dielectric permeability tensor by multi-angular measurement of the intensity of the Kerr effect has been presented. The problem was resolved for orthoferrites, albeit only with cubic symmetry of the dielectric permeability tensor and without allowance for birefringence. It should be noted that in multi-angular measurements, some of the formulas describing the reverse problem of finding magneto-optical parameters, may be linear. Furthermore, multi-angular measurements are often difficult in spectral studies. In the present work the reverse problem of magnetic ellipsometric determination of non-diagonal components of the dielectric permeability tensor was resolved for the case of rhombic syngonic crystals with allowance for birefringence for a single angle of incidence of light falling on a crystal. Two magnetoellipsometric parameters, unoccupied phase and unoccupied amplitude, measured polarimetrically, may be used to determine the non-diagonal tensor components with allowance for birefringence. References 4 (Russian).

Development of Data Bases on Basic Manufacturing Equipment To Produce Chemical Reagents and Ultrapure Materials

927M0242D Moscow KHIMICHESKAYA
PROMYSHLENNOST in Russian No 6, Jun 92 pp 372-375

[Article by R.M. Malyshev, V.V. Avseyev, A.M. Bessarabov, P.O. Vorontsov, and L.A. Leontyeva; UDC 54-485]

[Abstract] Data bases on basic manufacturing equipment are a principal component of computer-aided design systems in the chemical industry and are especially important in developing flexible manufacturing systems to produce relatively small batches of products. A series of data bases have been developed with consideration for the unique characteristics of the chemical reagents and ultrapure materials subsectors. The data bases are actually systems of programs to input, store, retrieve, and analyze information about different devices. Each of the programs in question was developed within the framework of the Foxbase data base manager for IBM PCs and may be used on any IBM-compatible with a hard disk and at least 512K of memory. All of the individual data bases are united by a common shell from which any of them may be called. The system is menu based, and help in using the system may be obtained by pressing a HELP key or in a separate help mode. The reactor data base contains information on the material of which the reactor is made, as well as the type of discharge, type of power supply, and type of mixer it possesses. The filtration equipment data base contains information on the operating mode, filter material, and filter type. The data bases contain information organized by general types of equipment as well as by specific equipment model numbers. Figures 2, tables 2; references 10 (Russian).

Properties of Ni-Cr-Mo Alloys for the Chemical Industry

927M0244A Moscow *KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian* No 8, Aug 92 pp 25-27

[Article by M.V. Rolek and F.Ye. Uayt, Krupp VDM AG, Germany; UDC 669.15.24'26'28-194:66]

[Abstract] The main problem faced by firms supplying metal products for the chemical industry is finding ways of reducing corrosion. The German firm Krupp VDM AG produces four nickel-chromium-molybdenum alloys that come well recommended to users in the chemical industry who must deal with problems of metal corrosion: S-276, S-4, 22, and 59. The alloy referred to as 59 is the newest in the group. It contains the following: 59% Ni, 23% Cr, 16% Mo, 1% Fe, 0.04% Si, and 0.05% C. It is highly resistant to intercrystallite corrosion (less than 0.03 mm/yr versus corrosion rates of more than 0.3 mm/yr for each of the other alloys in question. The alloy 59 also manifested the best (of the group) corrosion resistance in oxidizing and reducing media. S-276 (which contains 57% Ni, 16% Cr, 16% Mo, 3.5% W, 6% Fe, 0.04% Si, and 0.05% C) appears the most promising in most corrosion media (including sulfuric acid). Of the four alloys, the alloy 59 possesses the best resistance against selective corrosion, followed by the alloy 22. When selecting a material for specific conditions, however, one must consider more than just the corrosion resistance of the basic metal. Despite the fact that S-276 displayed maximum resistance to overall corrosion in a specific medium, the alloy 59 appeared best for applications involving welding. Tests of welds of alloy 59 conducted in accordance with method A of the standard ASTM G-28 confirmed that absence of intercrystallite corrosion in both the basic metal and the heat-affected zone. Figure 1, tables 5.

The New Corrosion-Resistant Steel 02Cr24Ni22NMo2 for Media With an Elevated Level of Corrosiveness

927M0244B Moscow *KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian* No 8, Aug 92 pp 27-29

[Article by E.G. Feldgandler, candidate of technical sciences, L.Ya. Savkina, M.M. Kristal, candidate of technical sciences, L.A. Stepanova, and N.S. Bezrukova; UDC 669.14.018.8:661.717.5.023]

[Abstract] The corrosion-resistant steel 03Cr17Ni14Mo3, which was developed jointly by the Central Scientific Research Institute of Ferrous Metallurgy and the Chemical Machine Building Scientific Research Institute primarily for use in manufacturing columns used in the carbamide synthesis process, has proved to possess satisfactory corrosion resistance in tests conducted in accordance with the method specified in All-Union State Standard 6032-89 and in full-scale tests. Under more rigid carbamide synthesis conditions,

however, it does not possess adequate corrosion resistance and cannot be considered a suitable substitute for the foreign steels currently produced to function under analogous conditions (such as 2RE69 [Sweden], 254SFER [Sweden], and X2CrNiMo25-22-2 [Italy]). The domestically produced steel 03Cr21Ni21MoMnNb is similar in composition to 2RE69 but has failed to manifest adequate corrosion resistance in actual performance tests (most likely because of the presence of a σ -phase in the metal even when it is in a hardened state). In an effort to reduce reliance upon foreign steels in carbamide production, researchers have developed a steel with an even higher level of corrosion resistance, i.e., the steel 02Cr24Ni22NMo2. Comparative tests of 02Cr24Ni22NMo2 and 03Cr21Ni21MoMnNb steel under rigid carbamide production conditions ($T = 200^\circ\text{C}$, $p = 200$ MPa) established the superiority of 02Cr24Ni22NMo2 steel. Specifically, it was found to be characterized by the following parameters (versus those of 03Cr21Ni21MoMnNb as shown in parenthesis): corrosion rate, 0.118 g/(m² × h) (vs. 0.692); percentage of surface subject to corrosion, 26.6 (vs. 56.2); minimum depth of corrosion, 0.36 mm (vs. 0.42); and average depth of corrosion, 0.179 mm (vs. 0.315). 02Cr24Ni22NMo2 steel is thus a better substitute for foreign steels of the 2RE69 type than 03Cr21Ni21MoMnNb is. 02Cr24Ni22NMo2 may also be used as a replacement for 03Cr21Ni21MoMnNb in the manufacture of equipment intended for use in sulfuric acid, nitric acid, phosphoric acid, and other highly corrosive media. Figure 1, tables 3.

The Geometric Structure of Two-Phase Composite Materials

927M0246A Moscow *VESTNIK MOSKOVSKOGO UNIVERSITETA - KHIMIYA in Russian* Vol 33 No 3, May-Jun 92 (manuscript received 24 Sep 91) pp 246-248

[Article by I.V. Golubtsov, M.B. Kachalov, M.I. Ozhovan, and M.V. Popov, Radiochemistry Department, Moscow State University; UDC 514.752+538.91+621.039.75]

[Abstract] The characteristics of the percolation cluster formed in a two-phase composite material were determined. A model composite was manufactured by hot-pressing powder polyethylene and sodium nitrate. In the composite studied the sodium nitrate particles were evenly distributed in the polyethylene matrix, thus simulating solidified forms of radioactive wastes. The change in the composite's characteristics close to the leakage threshold were jumplike in nature. The actual leakage threshold itself could not be determined, however, because of the significant fluctuations occurring in the vicinity of the leakage threshold. The leakage threshold was, however, determined based on the greatest correlation of the experimentally obtained data given specified critical indicators (0.175 for the specific material studied). The data obtained were also sufficient to conclude that a homogeneous percolation cluster with a fractal dimensionality of $D = 2.6$ forms and that the

theory of percolation is suitable for describing the physicochemical properties of composites similar to solidified radioactive wastes. Figures 4; references 6: 2 Russian, 4 Western.

Anodic Oxidation of Phenol on Platinum

927M0246B Moscow VESTNIK MOSKOVSKOGO
UNIVERSITETA - KHIMIYA in Russian Vol 33 No 3,
May-Jun 92 (manuscript received 26 Nov 91) pp 298-300

[Article by S.Yu. Shtyrkova, A.D. Semenova, and G.A. Bogdanovskiy, General Chemistry Department; UDC 541.128.13]

[Abstract] The anodic oxidation of phenol on platinum in different electrolytes was studied experimentally by using a combine of gas-liquid chromatography and ultraviolet spectroscopy. A Pt/Pt plate electrode with a visible surface of 4.2 cm² served as the working electrode, and a Pt/Pt wire (visible surface, 6.2 x 10⁻² cm²) was used for the pulse measurements. According to the voltammetric measurements, no oxidation of phenol on the platinized platinum electrode occurred in the zone of oxygen overvoltage. A shift to the region of potentials corresponding to an oxygen overvoltage resulted in a degree of phenol conversion that proved to be virtually independent of the medium's acidity. Phenol conversion rates of 35% and 37% were obtained in 1 N and 0.1 N H₂SO₄ solutions, respectively. The differential charging curve plotted for a resin-coated electrode in 1 N H₂SO₄ practically coincided with the background curve. Analogous results were obtained for platinized graphites with both continuous and insular platinum coatings. Under the electrolysis conditions studied, Pt/Pt electrodes appeared to hold little promise with respect to the destructive decomposition of phenol. Figure 1, tables 2; references 6 (Russian).

Design Theory and Practice and Trends in the Design of Contact Devices and Column Devices To Extract Pure Components From Mixtures of Liquids and Gases

927M0247B Ivanovo IZVESTIYA VYSSHIKH
UCHEBNYKH ZAVEDENIY: KHIMIYA I
KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 35
No 4, Apr 92 (manuscript received 3 Sep 91) pp 19-27

[Article by L.P. Razmolodin, Theoretical Mechanics Department, Yaroslavl Polytechnic Institute; UDC 66.021.3/4/069.82]

[Abstract] The existing methods of designing the contact devices of columns for extracting pure components from mixtures of liquids and gases were analyzed. The analysis results were then used as the foundation for developing a new design method that is based on a systems approach and information drawn from continuum mechanics, turbulence theory, statistical mechanics, and aerothermal diffusion. A series of new contact devices was then developed. They

facilitate turbulization of the gas-and-liquid layer by one- and two-dimensional effects, they reduce backward stirring because turbulization occurs in the local zone of the bubbling layer, they reduce coalescence and variance in the bubbles' size and dwell time distribution, and they increase the interface surface by a factor of 1.5. Experimental studies established that conventional perforated trays result in a trapping efficiency of 50-55% and, with turbulizers, have a trapping efficiency of 60-65%. The newly designed contact devices result in a trapping efficiency of 80%. The new devices were developed by using a 13-step design procedure that may be used as a general method of designing fractionating towers. The procedure entails calculating the tower's diameter, reflux-to-product ratio, number of trays, separation space height, and column height. Figures 3; references 25 (Russian).

The Transfer of Water Vapors in Composite Materials Based on SKEPT-50

927M0248B Ivanovo IZVESTIYA VYSSHIKH
UCHEBNYKH ZAVEDENIY: KHIMIYA I
KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 35
No 2, Feb 92 (manuscript received 6 May 91) pp 63-66

[Article by A.P. Belokurova, A.Ye. Chalykh, O.I. Koyfman, G.S.Kh. Gonsales, and T.I. Chalykh, Ivanovo Chemical Technology Institute and Physical Chemistry Institute, USSR Academy of Sciences; UDC 539.217.3]

[Abstract] The moisture permeability of SKEPT-50 vulcanizers modified by various polymer additives and inorganic fillers was examined. The study polymers were produced from mixtures of polyethylene, chlorosulfopolyethylene, butyl rubber, and chloroprene rubber (in amounts of 20-24% each). The following fillers were used in amounts ranging from 3 to 15%: A-175 Aerosil, vermiculite, Sb₂O₃, kaolin, chalk, and commercial-grade carbon. The film materials were produced by mixing and homogenizing the components at 335-353 K. The vulcanization was performed in a press under a pressure of 10.1 MPa at a temperature of 433 K for 25 minutes. Sulfur, Captax, Zimate, and thiuram were used as vulcanizers. The moisture permeability coefficients of the study polymer systems depended on the composition of the polymer mixture and the nature of the filler. The mixtures containing crystalline hydrophobic polyethylene, little-permeable butyl rubber, and chlorosulfopolyethylene were less permeable to water vapors than SKEPT-50 was. Adding chloroprene rubber to SKEPT-50 resulted in a slight increase in the moisture permeability coefficients obtained. Differences in the chemical structure of the polymers added to SKEPT-50 had virtually no effect on the coefficients of the diffusion of water vapor in the polymer mixtures: The coefficients ranged from 1.05 x 10⁻¹¹ to 1.45 x 10⁻¹¹ m²/c and were nearly half as much as the coefficients obtained for SKEPT-50. The inorganic fillers used to modify SKEPT-50 had very similar wetting contact angles (from 82 to 86°), which was evidence of their great hydrophobicity. The only exception was kaolin, which has a contact angle of 63° and is thus the most hydrophilic of the fillers studied. The greatest reduction in the water vapor diffusion coefficient was obtained by adding kaolin and vermiculite fillers. Figure 1, tables 2; references 5 (Russian).

Kinetics of the Radical Polymerization of N-Acryloylbenzoxazolone

927M0206B Tashkent UZBEKSKIY KHIMICHESKIY ZHURNAL in Russian No 1, Jan-Feb 92 (manuscript received 26 Dec 90) pp 19-21

[Article by M.M. Sultonov, B.L. Gafurov, S. Masharipov, and Zh. Allayev, Polymer Chemistry and Physics Institute, Uzbekistan Academy of Sciences; UDC 541.64]

[Abstract] The polymerization kinetics of N-acryloylbenzoxazolone in a dimethyl formamide solution in the presences of an initiator were studied by the dilatometric method at temperatures ranging from 333 to 363 K. Dinitrylazobisisobutyric acid was used as the initiator. The N-acryloylbenzoxazolone studied is a white powder that manifests good solubility in dimethyl formamide, dioxane, and chloroform but is insoluble in aliphatic hydrocarbons and water. The polymerization order of N-acryloylbenzoxazolone in dimethyl formamide was determined on the basis of the monomer and initiator. First, the concentration of initiator was kept constant while the concentration of monomer was varied at 0.1, 0.2, 0.3, and 0.4 mol/l. The polymerization rate increased as the concentration of monomer increased. Next, the concentration of monomer was kept constant while the concentration of initiator was varied from 3.45×10^{-4} to 1.72×10^{-3} mol/l. The order of the polymer with respect to the monomer (m), as found based on the logarithmic dependence of the polymerization rate on the concentration of monomer in dimethyl formamide, amounted to 1.15. The polymerization rate also increased as the concentration of initiator increased. The order of the reaction with respect to the initiator (n) amounted to 0.64. The deviations of m and n from 1 and 0.5 were attributed to the participation of monomer molecules in reactions of chain transfer to the solvent and to the participation of the polymer radicals in reactions of recombination with other radicals resulting in bimolecular breaking of the chains. An activation energy of 80 kJ/mol was found for N-acryloylbenzoxazolone, which is characteristic for acrylic monomers. The absolute values of the constants of the growth and breaking of the polymer chains at 298K were calculated by using the rotating-sector method to study the stationary and nonstationary kinetics of photoinduced polymerization in a dimethyl formamide solution. The data obtained confirmed the proportionality of the induction period of the concentration of inhibitor, with the polymerization rate after the inhibitor had been consumed and in its absence being equal. N-Acryloylbenzoxazolone was thus shown to be an active monomer that is easily engaged in radical polymerization. Figures 4; references 5 (Russian).

2 Polyampholyte 2-Methyl-5-Vinylpyridine Methacrylic Acid Copolymer

927M0224C Alma-Ata IZVESTIYA AKADEMII NAUK RESPUBLIKI KAZAKHSTAN: SERIYA KHIMICHESKAYA in Russian No 1(271), Jan-Feb 92 (manuscript received 15 Apr 91) pp 66-70

[Article by D. Ye. Nurgaliyeva, S. Ye. Kudaybergenov, Ye. A. Bekturov, and Ye. M. Shaykhutdinov, Chemical Sciences Institute, Alma-Ata; UDC 541.64+678.744]

[Abstract] Polyampholytes present in both acid and base functional group chains are of great interest since they include many naturally occurring polymers, such as proteins and nucleic acids. Amphoteric polymers are used widely as flocculants, complexons, desalting agents, and medicinal extenders. In the present work potentiometric titration and viscosimetry were used to study the behavior of the title copolymer. Dissociation constants were determined for acid and base groups and phase diagrams were prepared for the polyampholyte-salt system. Figures 4; references 8: 5 Russian, 3 Western.

The Unusual Photophysical Properties of a Polymer Film Made of Phenol

927M0241F Moscow IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA in Russian No 7, Jul 92 (manuscript received 2 Dec 91; after revision 12 Mar 92) pp 1691-1692

[Article by S.V. Rykov, Ye.D. Skakovskiy, L.Yu. Tychinskaya, and Ye.M. Usholik, Petrochemical Synthesis Institute imeni A.V. Topchiyev, Russian Academy of Sciences, and Physical and Organic Chemistry Institute, Belarus Academy of Sciences, Minsk; UDC 541.139]

[Abstract] An aqueous phenol solution (D_2O) was placed in a quartz ampule and irradiated with the full light of a DRSh-1000 mercury lamp. The thin milky polymer film that appeared on the ampule's surface was rinsed repeatedly with methanol and D_2O and then dried in order to remove the starting phenol and dissolved photolysis products. The ampule was then filled with pure D_2O , irradiated with ultraviolet light (the infrared light was filtered out), and subjected to NMR and ESR spectrometry studies. The new phenol polymer film, which absorbed about 95% of the light falling on it through the quartz ampule, converted the ultraviolet radiation passed throughout into coherent radio waves. It was hypothesized that the protons of the water are polarized during the deactivation (intercombination T-S transitions) of the excited electron states of the segments of the polymer chain when the molecules of the solvent make contact with the film's surface. The nuclear polarization mechanism was thought to be close to the triple mechanism of the chemical polarization of nuclei in glass, crystals, and solutions and the optical polarization of nuclei in molecular crystals. The essence of the said process lies in the fact that the nuclear spins and electron spins are polarized simultaneously during the process of a selective radiation intramolecular transition. The main difference in the effect observed is that it occurs at an interface. The quantum polarization yield was about 0.1, and the total luminous flux was about 10^{17} quanta/s. References 2: 1 Russian, 1 Western.

A New Approach To Developing Optimal Formulas of Polymer Composite Materials

927M0247D Ivanovo IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 35 No 4, Apr 92 (manuscript received 20 Aug 91) pp 78-82

[Article by Ye.V. Babenko, R.M. Galimzyanov, G.Ya. Muratova, and M.K. Yusupova, Synthetic Rubber Department, Kazan Chemical Technology Institute; UDC 678.765.6-678.01]

[Abstract] The method of reverse-phase gas chromatography, where the stationary phase is the research object, was used to determine the optimal formulas for thiokol-epoxy, epoxy-thiokol, and laproxy-epoxy polymer composite materials. The new method makes it possible to take a fundamentally new approach when studying oligomer-oligomer mixtures based on differentiating the relative contributions of the different intermolecular interactions that are characteristic of the systems under investigation. The method developed by Rohrschneider, which calls for using five standard characteristic materials that are each capable of participating primarily in one specified type of intermolecular interaction (ethanol, methyl ethyl ketone, benzene, nitromethane, and pyridine), is used to estimate the contributions that each of the types of intermolecular interactions makes to the general sorption pattern. A total of 22 epoxy-laproxy and thiokol-epoxy composite materials were examined by using a Khrom-4 chromatograph. Khromaton NAW-HMDS was used as a solid carrier, and the aforementioned standard Rohrschneider sorbates and saturated hydrocarbons (hexane, octane, nonane, and decane) were used as sorbates. Two epoxy-laproxy and four thiokol-epoxy composites were identified as being especially promising. The studies performed confirmed that polymer composite materials adjusted by reverse-phase gas chromatography have improved strain and strength characteristics. Figures 3, tables 2; references 4: 2 Russian, 2 Western.

A Mass Spectrometry Study of the Gas Permeability of Polymer Film Materials

927M0248A Ivanovo IZVESTIYA VYSSHIKH UCHEBNIKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA in Russian Vol 35 No 2, Feb 92 (manuscript received 7 Feb 91) pp 53-57

[Article by A.M. Pogrebnoy, L.S. Kudin, and M.F. Butman, Physics Department, Ivanovo Chemical Technology Institute; UDC 541.64:543.51]

[Abstract] A new attachment for the MI-1201 magnetic mass spectrometer makes it possible to conduct mass spectrometry studies of the gas permeability of polymer film materials includes a pressure gauge, tank to hold the film and gas that are being studied, and an analysis chamber. The gas pressure may be varied from 10^4 to 10^5 Pa. Films with a working surface of 12.57 mm^2 may be examined. The analysis chamber features an insert cut from a Schottky filter to reduce pressure differential-induced deformation of the study film and a vacuum

gate to prevent atmospheric air from entering the chamber. Tests of the new attachment confirmed that it may be used to determine the gas permeability of various gases in the following ranges [in $(\text{m}^3 \times \text{m})/(\text{m}^2 \times \text{s} \times \text{Pa})$]: He, 1×10^{-18} to 3×10^{-15} ; H_2 , 3×10^{-18} to 2×10^{-14} ; N_2 , 3×10^{-20} to 2×10^{-17} ; and O_2 , 2×10^{-20} to 1×10^{-16} . The relative error in the gas permeability values determined by using the new attachment depended mainly on the precision with which the calibrated volume had been determined, which according to the authors' estimates was about 20%. Figures 3, table 1; references 2 (Russian).

Water Sorption by Grafted Copolymers of Polycapraamide and Polyglycidyl Metacrylate

927M0251E St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 2 Apr 91) pp 2373-2378

[Article by L. P. Razumovskiy, N. Yu. Mosina, T. V. Druzhinina, V. G. Zaikov, L. S. Galbraykh, Institute of Chemical Physics imeni N. N. Semenov, USSR Academy of Sciences imeni A. M. Kosygin; UDC 541.64:66.081]

[Abstract] In developing a scientific-technological basis for production of modified polymers by the method of grafting polymerization of solid polymers, it is very important to study the processes of physical interaction between liquid components of the reaction medium and the polymer matrix. Sorption-diffusion properties of grafted copolymers of polycapraamide (PCA) and polyglycidyl metacrylate (PGMA) were investigated using films containing grafted PGMA at 17.8, 30.0, 35.0, 75.2 and 100.8%, based on PCA. Analysis of the data showed a decrease in water sorption directly proportional to the increased content of the grafted PGMA. The grafted polymer affected the intensity of cluster formation of the water adsorbed by the modified polyamide films. The increase in diffusion coefficient parallel to the increased content of PGMA allows an assumption that, during the process of grafted polymerization, the grafted polymer should not prevent the diffusion of monomer in the water emulsion into the polymer matrix. Tables 3; figures 4; references 7: 5 Russian, 2 Western (1 by Russian authors).

Properties of Hydrogels of 2-Hydroxyethylmetacrylate Copolymers Modified With Silicon Rubber

927M0251K St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 14 May 91) pp 2454-2456

[Article by N. A. Lavrov, T. S. Kryzhanovskaya, P. Vondarchek, Technological Institute, St. Petersburg; Prague Chemical- Technological Institute; UDC 678.744.78-13]

[Abstract] Copolymerization of 2-hydroxyethylmetacrylate (HEMA) with acrylamide of acrylic,

metacrylic and maleic acids in aqueous medium yields hydrogels which can be modified for the use as skin replacements. In present work properties were evaluated of hydrogels prepared from HEMA copolymers with metacrylic acid modified with silicon resin Leucopren G 1000. It was noted that an increased water content in the reaction mixture lowered the specific particle surface of the obtained polymers. It was shown that the samples obtained from smaller particles exhibited better strength characteristics both in dry and in the swollen state. These elastic hydrogels can be used in preparation of skin replacement materials. Table 1; references: 6 (Russian).

Copolymerization of 2-Hydroxyethylmetacrylate With Metacrylic Acid in Water

927M0251L St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 14 May 91) pp 2456-2457

[Article by N. A. Lavrov, A. F. Nikolayev, I. Yu. Mochalova, Technological Institute, St. Petersburg; UDC 678.744-13]

[Abstract] Copolymerization characteristics of 2-hydroxyethylmetacrylate (HEMA) with metacrylic acid (MAA) were investigated. The process was carried out at 25° in an atmosphere of argon and with an initiator system of ammonium persulfate-ascorbic acid. It was shown that an increase in the concentration of the macromolecules or of the components of the initiator system accelerated

the reaction rate. This copolymerization appears to proceed without a gel-effect. In presence of a cross-linking agent, methylenebisacrylamide, copolymerization of HEMA with MAA yielded hydrogels with water absorption of 350-465%. Table 1; references: 6 (Russian, 1 by Western author).

Investigation of Some Properties of Fiber Forming Acrylonitrile Copolymers With N-Vinylpyrrolidone

927M0251M St. Petersburg ZHURNAL PRIKLADNOY KHIMII in Russian Vol 64 No 11, Nov 91 (manuscript received 4 Apr 91) pp 2458-2460

[Article by G. Khamrakulov, I. I. Ismailov, M. A. Askarov, Tashkent Institute of Textile and Light Industry imeni Yu. Akhmetatayev; UDC 541.64:546.47]

[Abstract] Viscosity, structural and thermodynamic properties of copolymers obtained from acrylonitrile and N-vinylpyrrolidone (93:7) were studied. The material was obtained by low temperature radical copolymerization activated by donor-acceptor interaction of nitrogen containing monomer with electron acceptors. The thermally stable copolymers obtained could be used in production of synthetic nitron type fibers. The packing density of the structural elements and free energy of fiber mixing were determined. The thermodynamic analysis showed a weak copolymer-water affinity. Table 1; figures 2; references: 3 (Russian, 1 by Western authors).

**Flame Atomic-Absorption Determination of Gold in
Polymetallic Ores of Peoples Republic of Mongolia**

927M0223F Moscow *ZHURNAL ANALITICHESKOY
KHIMII in Russian* Vol 47, No 5, May 92 (manuscript
received 23 Sep 91) pp 934-936

[Article by G. Burmaa, G. Amar, S. V. Amosova, and V.
A. Potapov, Organic Chemistry Institute, Irkutsk; Chem-
istry Institute, Ulan-Bator; UDC 542.61:546.593]

[Abstract] The sensitivity of flame atomic-absorption spectrometry for the determination of gold in polymetallic ores of the Peoples Republic of Mongolia is insufficient. The limit for detection is lowered considerably during extraction concentration of the gold. One of the most effective extractants for gold is di-ter-butyl sulfide. In the present work an effective method was developed which includes concentration of gold (III) with 0.1 molar solution of di-ter-butyl sulfide in toluene from 2-3 molar nitric acid and subsequent analysis of the extract by flame atomic-absorption spectrometry. Reference 1 (Russian).

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